Attachment A

REPORT

Nexant
Reimagine tomorrow.

Duke Energy South Carolina DSM Market Potential Study

Submitted to Duke Energy

December 19, 2016

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1 Executive Summary

In January, 2016, Duke Energy retained Nexant, Inc., to determine the potential energy and demand savings that could be achieved by demand-side management (DSM) programs[1] in the Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) service territories. This report describes the potential for DSM savings among these two service territories in South Carolina. The main objectives of the study include:

- Providing a market potential study, which estimates the technical, economic and realistic achievable market potential energy savings over the short term (5 year projection), intermediate term (10 year projection), and long term (25 year projection).
- Estimating the potential savings of both energy and demand savings for Duke Energy's South Carolina service territory.
- Development of savings estimates with a focus on different perspectives: compliance and system planning.
- Estimating program costs to acquire all the achievable potential, along with cost-effectiveness results.

1.1 Methodology

This study utilized Nexant's Microsoft Excel-based modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to calculate multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual program savings. The methodology for the energy efficiency potential assessment was based on a hybrid "top-down/bottom-up" approach. The assessment started with the current load forecast, then disaggregated it into its constituent customer-class and end use components; it examined the effect of the range of energy efficiency measures and practices on each end use, taking into account fuel shares, current market saturations, technical feasibility, and costs. These unique impacts were aggregated to produce estimates of potential at the end use, customer class, and system levels.

[1] In this report, the term "demand-side management", or "DSM", is used to describe energy savings and load management opportunities and programs that focus on the customer side of the meter, including both energy efficiency (EE) and demand response (DR).

1.2 Savings Potential

1.2.1 DEC Energy Efficiency Potential

The estimated technical, economic, and achievable potential scenarios are summarized in Table 1-1, which lists cumulative energy and demand savings, as well as the levelized cost, for each type of potential.

Table 1-1: DEC Energy Efficiency Potential

	Energy Efficiency Potential (2017-2041)			
	Energy (GWh)	% of 2041 Base Sales[2]	Demand (MW)	Levelized Cost[3] ($/kWh)
Technical Potential	5,859	20%	1,370	$0.417
Economic Potential	3,552	12%	956	$0.036
Achievable Program Potential – Base Scenario				
5-yr Cumulative	405	1.8%[4]	99	$0.064
10-yr Cumulative	718	3.0%[5]	180	
25-Yr Cumulative	1,195	4.1%	285	
Achievable Program Potential – Enhanced Scenario				
5-yr Cumulative	601	2.7%[4]	157	$0.058
10-yr Cumulative	1,105	4.6%[5]	303	
25-Yr Cumulative	1,637	5.6%	413	

1.2.2 DEP Energy Efficiency Potential

The estimated technical, economic, and achievable potential scenarios are summarized in Table 1-2, which lists cumulative energy and demand savings, as well as the levelized cost, for each type of potential.

[2] Energy savings as a percentage of base sales includes savings impacts that incorporate program opt outs by a portion of eligible commercial and industrial sector customers, as described in Section 3.6.3, compared with total sales forecast for residential, commercial, and industrial sectors.

[3] Levelized cost presented from the total resource cost (TRC) perspective. Technical and economic potential costs include incremental measure costs; while achievable program potential costs include both incremental measure costs and program delivery and administrative costs.

[4] Energy savings percentage of 2021 Base Sales

[5] Energy savings percentage of 2026 Base Sales

Table 1-2: DEP Energy Efficiency Potential

Sector	Energy Efficiency Potential (2017-2041)			
	Energy (GWh)	% of 2041 Base Sales[6]	Demand (MW)	Levelized Cost[7] ($/kWh)
Technical Potential	1,667	20%	340	$0.462
Economic Potential	983	12%	228	$0.058
Achievable Program Potential – Base Scenario				
5-yr Cumulative	114	1.7%[8]	25	$0.074
10-yr Cumulative	193	2.8%[9]	42	
25-Yr Cumulative	308	3.7%	62	
Achievable Program Potential – Enhanced Scenario				
5-yr Cumulative	164	2.5%[8]	40	$0.060
10-yr Cumulative	291	4.2%[9]	74	
25-Yr Cumulative	410	4.9%	93	

1.2.3 DEC Demand Response Potential

Demand response opportunities were analyzed for DEC's South Carolina service territory to determine the amount of summer and winter peak capacity that could be reduced through demand response initiatives from a technical, economic, and program potential perspective. While technical and economic potential are theoretical upper limits, for program-based DR, participation rates are calculated as a function of the incentives offered to each customer group. For a given incentive level and participation rate, the cost-effectiveness of each customer segment is evaluated to determine whether the aggregate DR potential from that segment should be included in the achievable potential.

Figure 1-1 and Figure 1-2 summarize the summer peak and winter peak demand response potential estimated for three program scenarios analyzed in the study.

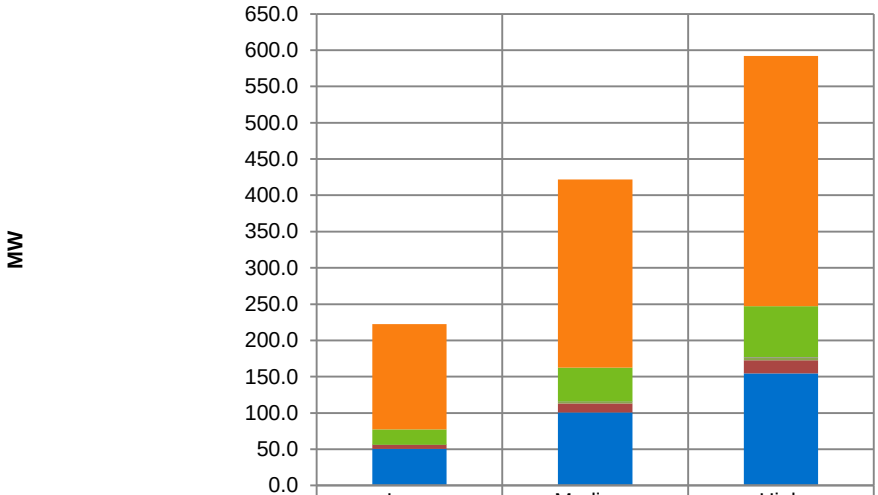
[6] Energy savings as a percentage of base sales includes savings impacts that incorporate program opt outs by a portion of eligible commercial and industrial sector customers, as described in Section 3.6.3, compared with total sales forecast for residential, commercial, and industrial sectors.

[7] Levelized cost presented from the total resource cost (TRC) perspective. Technical and economic potential costs include incremental measure costs; while achievable program potential includes both incremental measure costs and program delivery and administrative costs.

[8] Energy savings percentage of 2021 Base Sales

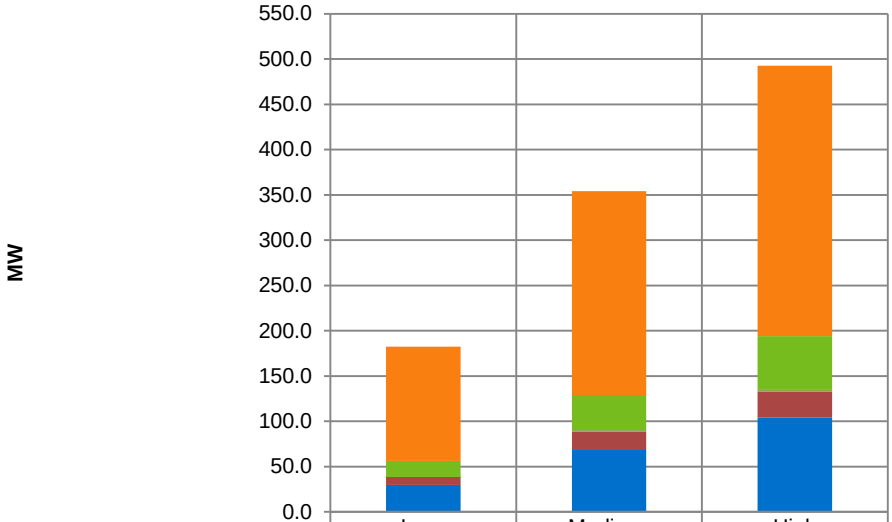
[9] Energy savings percentage of 2026 Base Sales

Figure 1-1 DEC Demand Response Summer Peak Capacity Program Potential



	Low	Medium	High
Large C&I - 1 MW and Up	145.2	259.4	344.7
Large C&I - 500 kW to 1 MW	20.8	46.6	70.4
Large C&I - 300 kW to 500 kW	0.0	0.1	0.1
Small and Medium Business	0.1	2.8	4.1
Residential Multi-Family	5.8	12.0	18.0
Residential Single Family	50.5	100.9	154.6

Figure 1-2 DEC Demand Response Winter Peak Capacity Program Potential



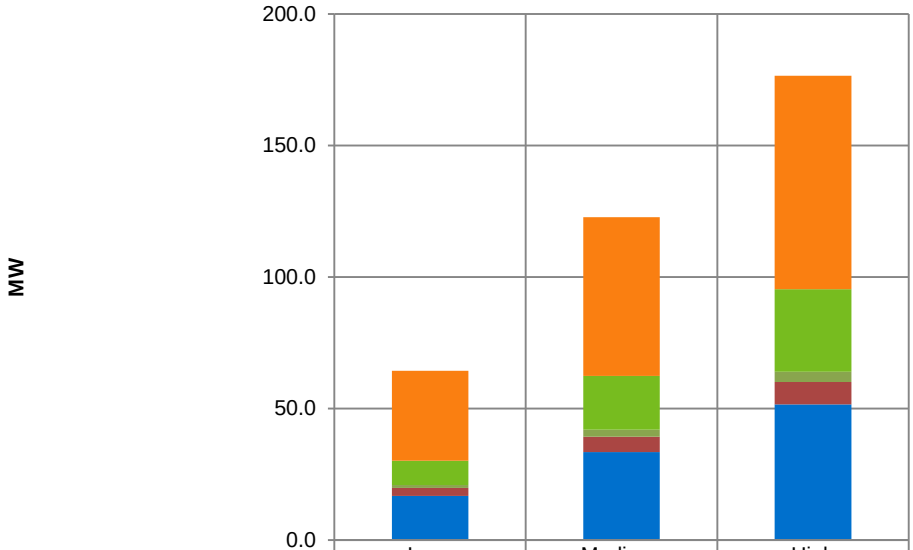
	Low	Medium	High
Large C&I - 1 MW and Up	126.2	225.0	298.6
Large C&I - 500 kW to 1 MW	17.4	39.0	58.9
Large C&I - 300 kW to 500 kW	0.0	0.0	0.1
Small and Medium Business	0.0	1.4	2.0
Residential Multi-Family	9.1	19.2	28.6
Residential Single Family	29.6	69.5	104.4

1.2.4 DEP Demand Response Potential

Demand response opportunities were analyzed for DEP's South Carolina service territory to determine the amount of summer and winter peak capacity that could be reduced through demand response initiatives from a technical, economic, and program potential perspective. While technical and economic potential are theoretical upper limits, for program-based DR, participation rates are calculated as a function of the incentives offered to each customer group. For a given incentive level and participation rate, the cost-effectiveness of each customer segment is evaluated to determine whether the aggregate DR potential from that segment should be included in the achievable potential.

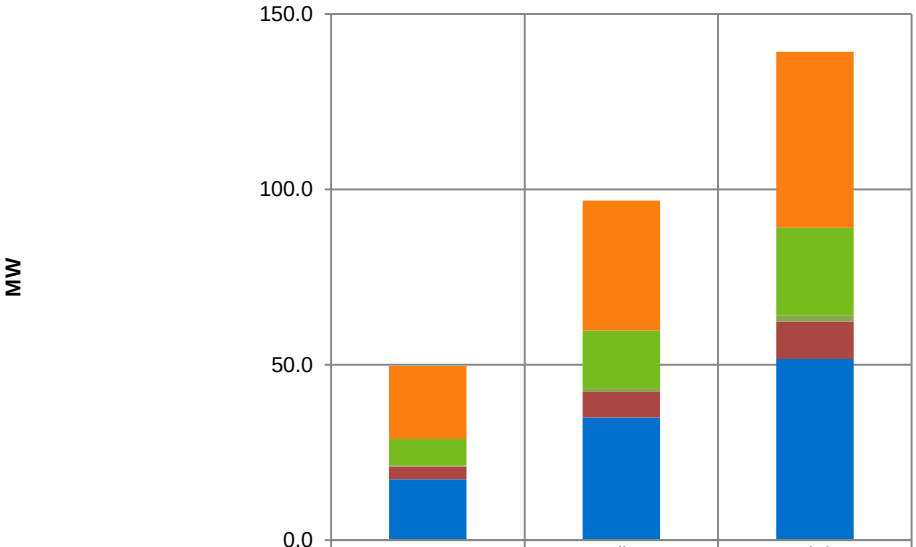
Figure 1-3 and Figure 1-4 summarize the summer peak and winter peak demand response potential estimated for three program scenarios analyzed in the study.

Figure 1-3 DEP Demand Response Summer Peak Capacity Program Potential



	Low	Medium	High
Large C&I - 1 MW and Up	34.2	60.4	81.2
Large C&I - 500 kW to 1 MW	9.3	20.5	31.3
Large C&I - 300 kW to 500 kW	0.0	0.0	0.0
Small and Medium Business	1.1	2.6	3.9
Residential Multi-Family	3.0	5.8	8.5
Residential Single Family	16.8	33.5	51.5

Figure 1-4 DEP Demand Response Winter Peak Capacity Program Potential



	Low	Medium	High
Large C&I - 1 MW and Up	20.9	37.1	50.1
Large C&I - 500 kW to 1 MW	7.5	16.4	25.1
Large C&I - 300 kW to 500 kW	0.0	0.0	0.0
Small and Medium Business	0.3	1.1	1.6
Residential Multi-Family	3.7	7.3	10.7
Residential Single Family	17.3	35.0	51.7

2 Introduction

2.1 Objectives and Deliverables

In January, 2016, Duke Energy retained Nexant, Inc., to determine the potential energy and demand savings that could be achieved by demand-side management (DSM) programs[10] in the Duke Energy's South Carolina service territory (DEC and DEP). The main objectives of the study included:

- Providing a market potential study, which estimates the technical, economic and realistic achievable market potential energy savings over the short term (5 year projection), intermediate term (10 year projection), and long term (25 year projection).
- Estimating the potential savings of both energy and demand savings for Duke Energy's South Carolina service territory.
- Development of savings estimates with a focus on two different perspectives: compliance and system planning.
- Estimating program costs to acquire all the achievable potential, along with cost effectiveness results.

In developing the market potential for DEC and DEP, the following deliverables were developed by Nexant as part of the project and are addressed in this report:

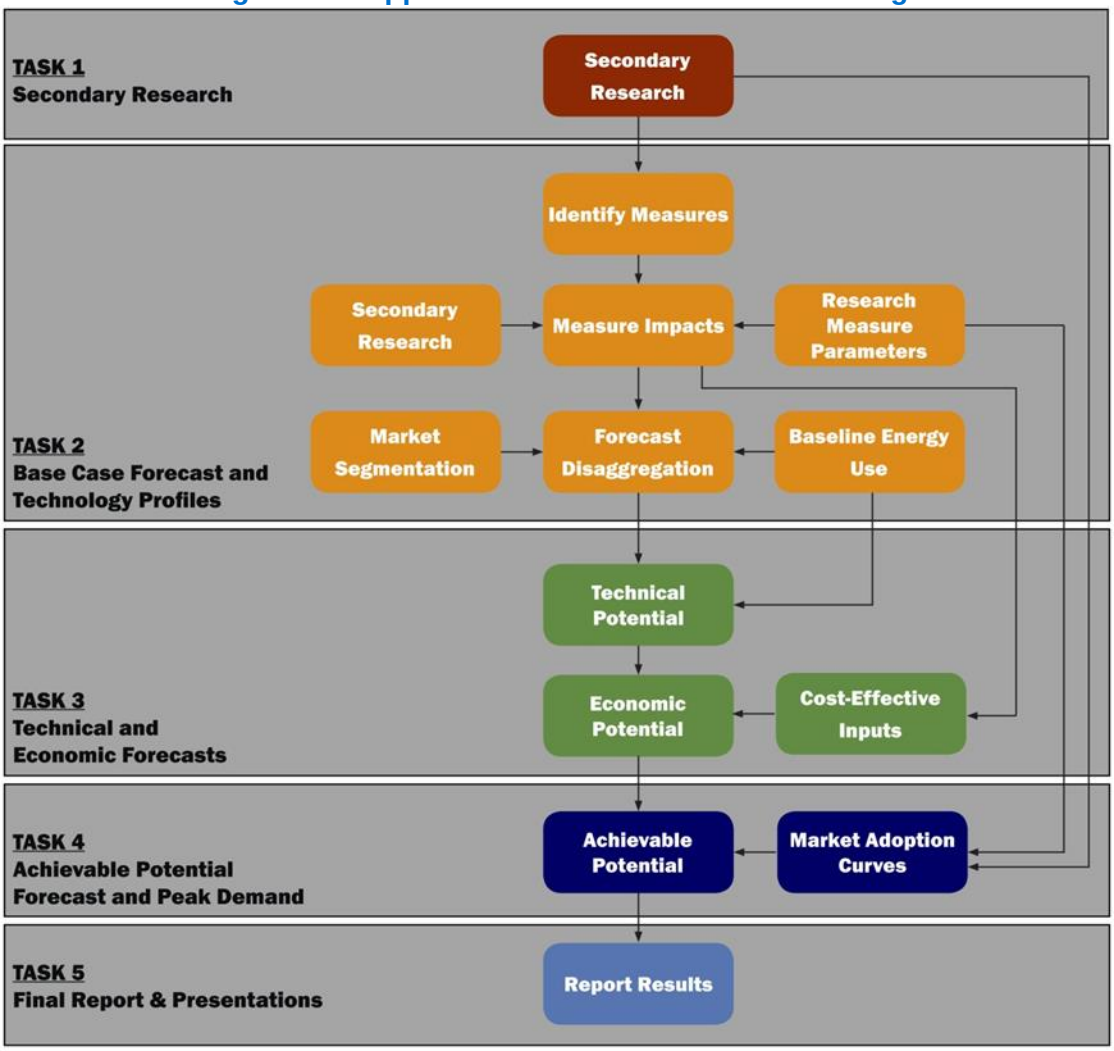
- Project plan.
- Measure list and detailed assumption workbooks.
- Summary of major assumptions utilized.
- Disaggregated baseline by year, state, sector, end use, technology saturations, and energy and demand consumptions.
- List of forward looking, DSM program concepts, along with the applicable markets, measures, and estimated delivery costs.
- List of cost-effective energy efficiency measures and demand response technologies and products.
- Market potential energy savings for technical, economic and realistic program achievable potential scenarios for short, intermediate and long term periods.
- Estimated program costs to acquire all the achievable potential.
- Supporting calculation spreadsheets.

[10] In this report, the term "demand-side management", or "DSM", is used to describe energy savings and load management opportunities and programs that focus on the customer side of the meter, including both energy efficiency (EE) and demand response (DR).

2.2 Methodology

Energy efficiency and market potential studies involve a number of analytical steps to produce estimates of each type of energy efficiency potential: technical, economic, and achievable. This study utilized Nexant's Microsoft Excel-based modeling tool, TEA-POT (Technical / Economic / Achievable Potential). This modeling tool was built on a platform that provides the ability to calculate multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual program savings. The model provides transparency into the assumptions and calculations for estimating market potential. TEA-POT has been consistently refined over the past several years with industry best practices, with the most recent upgrade occurring in 2016. The methodology for the energy efficiency potential assessment is based on a hybrid "top-down/bottom-up" approach.

Figure 2-1: Approach to Market Potential Modeling



As illustrated in Figure 2-1, the assessment started with the current load forecast, then disaggregated it into its constituent customer-class and end use components, and examines the effect of the range of energy efficiency measures and practices on each end use, taking into account

fuel shares, current market saturations, technical feasibility, and costs. These unique impacts were aggregated to produce estimates of potential at the technology, end use, customer class, and system levels.

The market potential in South Carolina territory can be characterized by levels of opportunity. The ceiling or theoretical maximum is based on commercialized and emerging technologies and behavior measures, whereas the realistic savings that may be achieved through DSM programs reflect real world market constraints such as utility budgets, customer perspectives and energy efficiency policy. This analysis defines these levels of energy efficiency potential according to the Environmental Protection Agency's (EPA) National Action Plan for Energy Efficiency (NAPEE) as illustrated in Figure 2-2.

Figure 2-2: Energy Efficiency Potential

EPA – National Guide for Resource Planning

- Technical Potential is the theoretical maximum amount of energy and capacity that could be displaced by efficiency, regardless of cost and other barriers that may prevent the installation or adoption of an energy efficiency measure. Technical potential is only constrained by factors such as technical feasibility and applicability of measures.
- Economic Potential is the amount of energy and capacity that could be reduced by efficiency measures that pass a cost-effectiveness test. The Total Resource Cost (TRC) Test estimates the measure costs to both the utility and customer.
- Achievable Potential is the energy savings that can feasibly be achieved through program and policy interventions.
- Program Potential reflects the realistic quantity of energy savings the utility can realize through DSM programs during the horizon defined in the study. Potential delivered by programs is often less than achievable potential due to real-world constraints, such as utility program budgets, effectiveness of outreach, and market delays.

This study explored technical, economic, and achievable program potential over a 25-year period from January, 2017, to December, 2041. The quantification of these three levels of energy efficiency potential is an iterative process reflecting assumptions on cost effectiveness that drill down the opportunity from the theoretical maximum to realistic program savings. The California Standard

Practice Manual (SPM) provides the methodology for estimating cost effectiveness of energy efficiency measures, bundles, programs or portfolios based on a series of tests representing the perspectives of the utility, customers, and societal stakeholders. In this potential study, individual measures were screened for cost-effectiveness using the total resource cost (TRC) from the Standard Practice Manual.

Naturally occurring conservation is captured by this analysis in the load forecast. Effects of energy codes and equipment standards were considered by incorporating changes to codes and standards and marginal efficiency shares in the development of the base-case forecasts. Additionally the model accounted for future federal code changes that will impact efficiencies, and therefore overall potential energy savings, of specific measures and end uses. such as motors and lighting.

Nexant estimated DSM program savings potential based on a combination of market research, analysis, and a review of Duke Energy's existing DSM programs, all in coordination with Duke Energy. DSM programs that Nexant examined included both energy efficiency (EE) and demand-response (DR) programs; therefore, this report is organized to offer detail on both types of programs.

The remainder of the report provides detailed methodologies for each step in the potential analysis process, together with the results and analyses, according to the following sections:

- Market Characterization
- DSM Measure List
- Technical Potential
- Economic Potential
- Program Potential
- Conclusions and Recommendations

3 End Use Market Characterization

The base year energy use and sales forecast provided the reference point to determine potential savings. The end use market characterization of the base year energy use and reference case forecast included customer segmentation and load forecast disaggregation. The characterization is described in this section, while the subsequent section addresses the measures and market potential energy savings scenarios.

3.1 Methodology

3.1.1 Customer Segmentation

In order to estimate energy efficiency (EE) and demand response (DR) potential, the sales forecast and peak load forecasts were segmented by customer characteristics. Assessing the DSM savings potential required an understanding of how DSM measures apply to electricity customers. As electricity consumption patterns vary by customer type, Nexant segmented customers into homogenous groups to identify which customer groups are eligible to adopt specific energy efficiency technologies or to provide DSM grid services.

Customer segmentation also addressed the business need to deliver cost-effective DSM programs. Significant cost efficiency can be achieved through strategic DSM program designs that recognize and address the similar DSM potential that exists within each customer group. Nexant segmented DEC and DEP customers according to the following:

1) By Sector – how much of the Duke Energy's energy sales, summer peak, and winter peak load forecast is attributable to the residential, commercial, and industrial sectors?
2) By Customer – how much electricity does each customer typically consume annually and during system peaking conditions?
3) By End Use – within a home or business, what equipment is using electricity during the peak? How much energy does this end-use consume over the course of a year?

This analysis identified the segments of customers ineligible for DSM, such as Opt Out/Self Direct commercial and industrial customers, as well as the share of the load forecast that is served by non-premises accounts.

Table 3-1 summarizes the segmentation within each sector. The customer segmentation is discussed in Section 3.1.1. In addition to the segmentation described here for the EE analysis, the residential customer segments were further segmented by heating type (electric heat, gas heat, or unknown) and by annual consumption deciles within each sub-segment for the DR analysis. The goal of this further segmentation was to understand which customer groups were most cost-effective to recruit and allow for more targeted marketing of DR programs.

Table 3-1: Customer Segments and Sub-Sectors

Residential	Commercial		Industrial	
Single Family	Assembly	Lodging/ Hospitality	Chemicals and plastics	Primary resource industries
Multi Family	College and University	Miscellaneous	Construction	Stone, clay, glass, and concrete
	Data Center	Offices	Electrical and electronic equipment	Textiles and leather
	Grocery	Restaurant	Lumber, furniture, pulp, and paper	Transportation equipment
	Healthcare	Retail	Metal products and machinery	Water and wastewater
	Hospitals	Schools K-12	Miscellaneous manufacturing	
	Institutional	Warehouse		

From an equipment and energy use perspective, each segment has variation within each building type or sub-sector. For example, the energy consuming equipment in a convenience store will vary significantly from the equipment found in a supermarket. To account for this variation, the selected end uses describe energy savings potential that are consistent with those typically studied in national or regional surveys. These end uses are listed in Table 3-2.

Table 3-2: End Uses

Residential End Uses	Commercial End Uses	Industrial End Uses
Space heating	Space heating	Process heating
Space cooling	Space cooling	Process cooling
Domestic hot water	Domestic hot water	Compressed air
Ventilation and circulation	Ventilation and circulation	Motors, pumps
Lighting	Interior lighting	Motors, fans, blowers
Cooking	Exterior lighting	Process-specific
Refrigerators	Cooking	Lighting
Freezers	Refrigeration	HVAC
Clothes washers	Office equipment	Other
Clothes dryers	Miscellaneous	
Dishwashers		
Plug load		
Miscellaneous		

For the DR assessment, the end uses targeted were limited to end-uses with controllable load for residential customers and small/medium businesses (SMB), but all load during peak hours for large commercial and industrial (large C&I) customers, who potentially would be willing to reduce electricity consumption for a limited time if offered a large enough incentive during temporary system

peak demand conditions. For residential customers, AC/heating loads, as well as pool pumps and electric water heaters for certain program potential scenarios, were studied. For SMB customers, the analysis was limited to AC/heating loads.

3.1.2 Forecast Disaggregation

Although the primary focus of the EE potential study was the electricity consumption forecast and the primary focus of the DR potential study was the peak load forecasts, the accuracy of the demand impacts and cost-effectiveness screening in the EE potential study is enhanced by a detailed approach to peak load disaggregation. Therefore, during the development of all the baselines, the energy efficiency and demand response teams coordinated with each other, to ensure consistent assumptions and to avoid potential double counting of potential.

Additionally, a common understanding of the assumptions and granularity in the baseline load forecast was developed with input with Duke Energy. Key discussion topics reviewed with Duke Energy included:

- How are Duke Energy's current DSM offerings reflected in the energy and demand forecast?
- What are the assumed weather conditions and hour(s) of the day when the system is projected to peak?
- How much of the load forecast is attributable to accounts that are not eligible for DSM programs or have opted-out of the DSM rider?
- How are projections of population increase, changes in appliance efficiency, and evolving distribution of end use load shares accounted for in the 25 year peak demand forecast?
- If separate forecasts are not developed by region or sector, are there trends in the load composition that Nexant should account for in the study?

3.1.2.1 Electricity Consumption (kWh) Forecast

Nexant segmented the DEC and DEP electricity consumption forecasts into electricity consumption load shares by customer class and end use. The baseline customer segmentation represents the South Carolina electricity market by describing how electricity was consumed within the service territory. Nexant developed these forecasts for the years 2017–2041, and based it on data provided by Duke Energy. The data addressed current baseline consumption, system load and sales forecasts.

3.1.2.2 Peak Demand (kW) Forecast

A fundamental component of DR potential was establishing a baseline forecast of what loads or operational requirements would be absent existing dispatchable DR or time varying rates. This baseline was necessary to assess how DR can assist in meeting specific planning and operational requirements. We utilized Duke's summer and winter peak demand forecast, which was developed for system planning purposes.

3.1.2.3 Estimating Consumption by End-Use Technology

As part of the forecast disaggregation, Nexant developed a list of electricity end uses by sector (Table 3-2). To develop this list, Nexant began with Duke Energy's estimates of average end-use consumption by customer and sector. Nexant combined these data with other information, such as Duke Energy's residential appliance saturation surveys, to develop estimates of customers' baseline consumption. Nexant augmented the Duke Energy data with data available from public sources, such as the Energy Information Agency's recurring data-collection efforts that describe energy end-use consumption for the residential, commercial, and manufacturing sectors.

To develop estimates of end-use electricity consumption by customer segment and end use, Nexant applied estimates of end-use saturation, energy fuel share, and equipment-type saturation to the average energy consumption for each sector. The following data sources and adjustments were used in developing the base year 2016 sales by end use:

Residential sector:

- The disaggregation was based on DEC and DEP rate class load shares and intensities; adjustments were made for dwelling type.
- Adjustments were made to the baseline intensity to account for differences in end use saturation, fuel source, and equipment saturation as follows:
  - Duke Energy rate class load share is based on average per customer.
  - Nexant made conversions to usage data provided from individual customer accounts.
  - Outcome is designed to reflect customers' opportunities.

Commercial sector:

- The disaggregation was based on DEC and DEP rate class load shares, intensities, and EIA CBECS data.
- Segment data from EIA, DEC and DEP.
- Adjustments were made to the baseline intensity for end use saturation, fuel source, and equipment saturation as follows:
  - Duke Energy rate class load share based on EIA CBECS and end use forecasts from DEC and DEP.
  - Nexant made conversions to usage data provided from individual customer accounts.
  - Outcome is designed to reflect customers' opportunities.

Industrial sector:

- The disaggregation was based on DEC and DEP rate class load shares, intensities, and EIA MECS data.
- Segment data from EIA, DEC and DEP.
- Adjustments were made to the baseline intensity for end use saturation, fuel source, and equipment saturation as follows:

- Duke Energy rate class load share based on EIA MECS and end use forecasts from DEC and DEP.
- Nexant made conversions to usage data provided from individual customer accounts.
- Outcome is designed to reflect customers' opportunities.

3.2 Analysis of Customer Segmentation

Customer segmentation is important to ensuring that an MPS examines DSM measure savings potential in a manner that reflects the diversity of energy savings opportunities existing across Duke Energy's customer base. Duke Energy provided Nexant with data concerning the premise type and loads characteristics for all customers for the MPS analysis. Nexant examined the received data from multiple perspectives to identify customer segments. Nexant's approach to segmentation varied slightly for commercial and residential accounts, but the overall logic was consistent with the concept of expressing the accounts in terms that were relevant to DSM opportunities. The following three sections describe the segmentation analysis and results for commercial and industrial C&I accounts (Sections 3.1.1 and 3.1.2) and residential accounts (Section 3.1.3).

3.2.1 Commercial and Industrial Accounts

Nexant segmented C&I accounts according to two approaches: North American Industry Classification System (NAICS) codes and peak energy demand.

3.2.1.1 North American Industry Classification System Codes

The approach to examining DEC and DEP's C&I accounts was based on the NAICS codes, which Duke Energy provided as part of the customer data. Nexant further classified the customers in this group as *either* commercial or industrial, on the basis of DSM measure information available and applicable to each. For example, agriculture and forestry DSM measures are commonly considered industrial savings opportunities; therefore, small farms with relatively low energy demand were included in this group, regardless of their rate schedule classification. Nexant based this classification on the types of DSM measures applicable by segment, rather than on the annual energy consumption or maximum instantaneous demand from the segment as a whole.

3.2.1.2 Peak Energy Demand Categories

Nexant also classified C&I accounts according to their maximum energy demand in kilowatts. Customers' maximum instantaneous demand is a basic driver of demand-response potential. Nexant created five customer groups for the C&I sector (Table 3-3 and Table 3-4: Number of DEP Commercial Accounts by Demand Segment).

Table 3-3: Number of DEC Commercial Accounts by Demand Segment

< 30 kW	30 – 70 kW	75 – 500 kW	500 kW – 1 MW	> 1 MW	Total
73,753	7,614	5,160	545	550	87,622

Table 3-4: Number of DEP Commercial Accounts by Demand Segment

< 30 kW	30 – 70 kW	75 – 500 kW	500 kW – 1 MW	> 1 MW	Total
25,129	2,680	2,045	197	147	30,198

Table 3-5: Summary of DEC Commercial and Industrial Market Characteristics and Table 3-6: Summary of DEP Commercial and Industrial Market Characteristics present the percentage of customers, annual consumption, and maximum demand for each demand segment. All consumption and demand values are based on the period January 2015–January 2016. Figure 3-1 and Figure 3-2: DEP Market Composition by Demand Segment presents a graphical summary of these data.

Table 3-5: Summary of DEC Commercial and Industrial Market Characteristics

Attribute	< 30 kW	30 – 70 kW	75 – 500 kW	500 kW – 1 MW	> 1 MW
Customer #	84.17%	8.69%	5.89%	0.62%	0.63%
Consumption	5.00%	4.73%	14.24%	6.98%	69.05%
Demand	5.65%	7.77%	19.72%	8.42%	58.44%

Table 3-6: Summary of DEP Commercial and Industrial Market Characteristics

Attribute	< 30 kW	30 – 70 kW	75 – 500 kW	500 kW – 1 MW	> 1 MW
Customer #	83.21%	8.87%	6.77%	0.65%	0.49%
Consumption	7.17%	5.75%	16.59%	7.24%	63.25%
Demand	1.33%	8.39%	21.67%	8.59%	60.02%

Figure 3-1: DEC Market Composition by Demand Segment

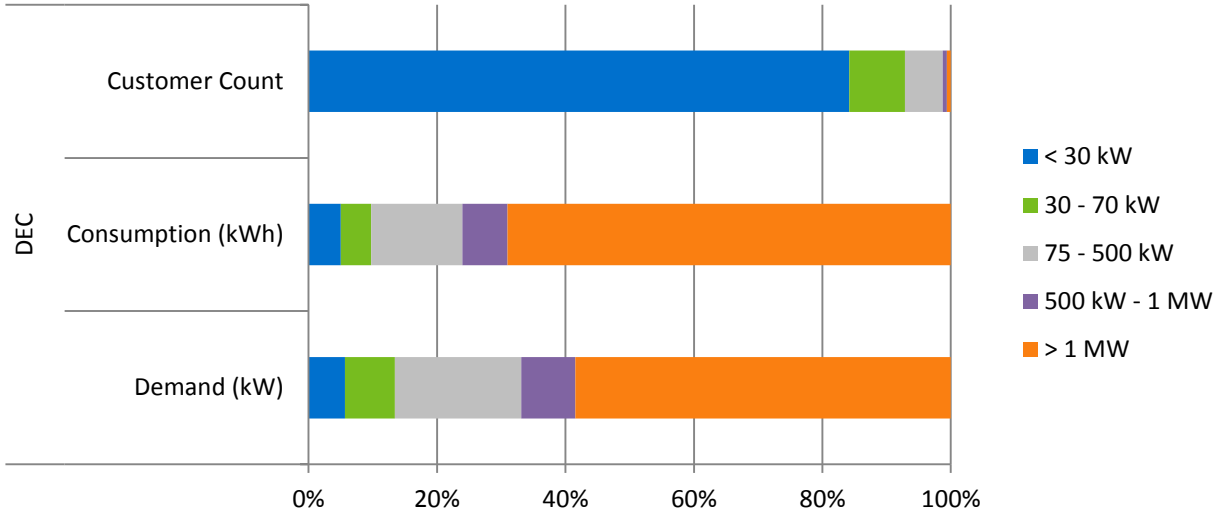
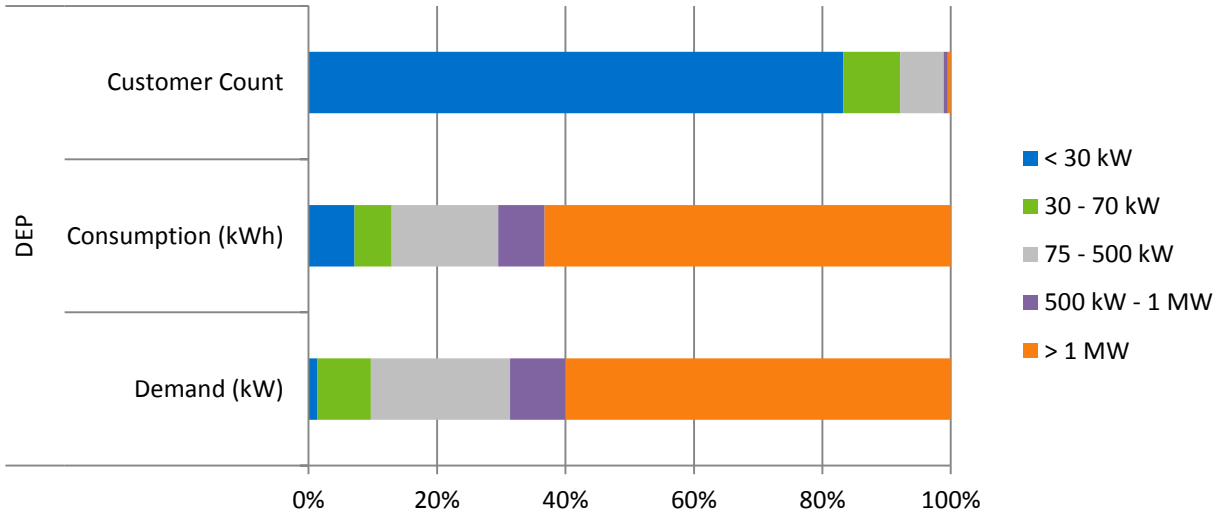


Figure 3-2: DEP Market Composition by Demand Segment



Based on the analysis, Nexant described commercial and industrial DSM potential according to the economic segments summarized in Table 3-1. For details concerning customer demand characteristics according to these commercial and industrial segments, see Appendix C.

3.2.2 Residential Accounts

Segmentation of residential customer accounts enabled Nexant to align DSM opportunities with appropriate DSM measures. Nexant segmented the residential sector according to two fields provided in the Duke Energy data: customer dwelling type (single family or multi-family), and space heat fuel source (electric, gas, and "unknown"). The resulting distribution of customers and total electricity consumption by each segment is presented below in Table 3-7 and Table 3-8. Figure 3-3 and Figure 3-4 present this information graphically.

Table 3-7: DEC Residential Customer Market Composition by Fuel Source

Attribute	Electricity	Gas
Customer Count	43.26%	56.74%
Total kWh Consumption	46.86%	53.14%

Table 3-8: DEP Residential Customer Market Composition by Fuel Source

Attribute	Electricity	Gas
Customer Count	66.49%	33.51%
Total kWh Consumption	69.71%	30.29%

Figure 3-3: DEC Residential Market Segmentation by Heat Source

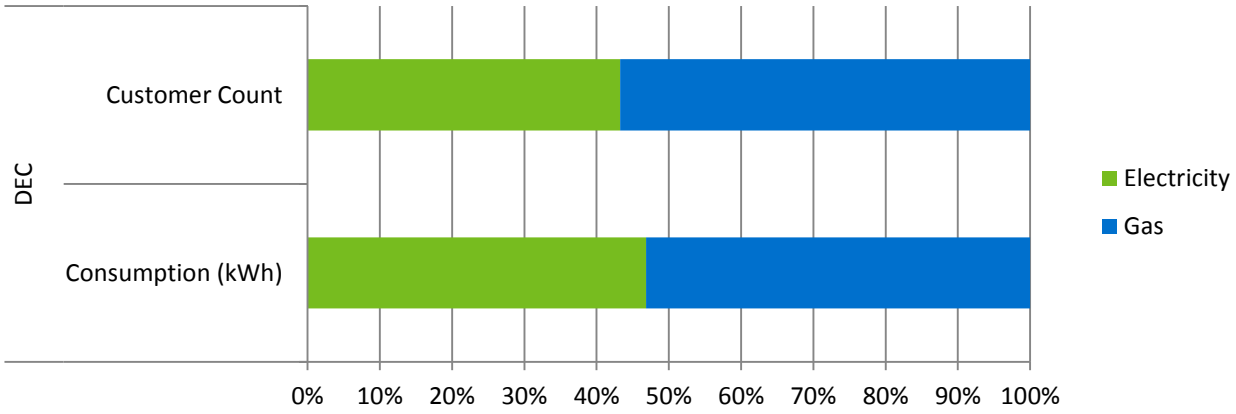
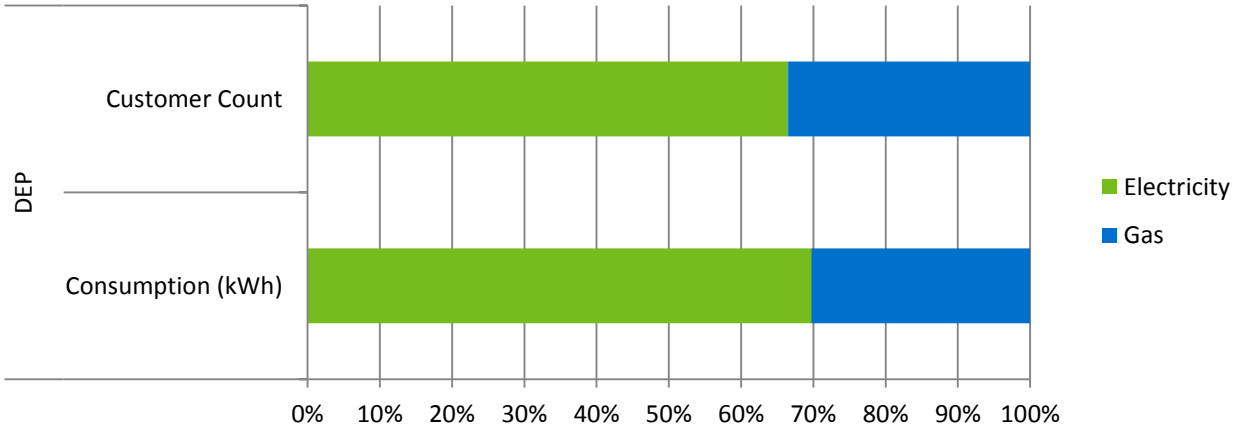


Figure 3-4: DEP Residential Market Segmentation by Heat Source



Segmentation according to dwelling unit type is presented in Table 3-9 and Table 3-10. Figure 3-5 and Figure 3-6: DEP Residential Market Characteristics by Type of Dwelling Unitprovide a graphical illustration of the customer segmentation. Detailed segmentation is presented in Appendix C.

Table 3-9: DEC Residential Market Characteristics by Type of Dwelling Unit

Attribute	Multi-Family	Single-Family
Customer Count	12.25%	87.75
Total kWh Consumption	6.76%	93.24%

Table 3-10: DEP Residential Market Characteristics by Type of Dwelling Unit

Attribute	Multi-Family	Single-Family
Customer Count	13.91%	86.09%
Total kWh Consumption	7.76%	92.24%

Figure 3-5: DEC Residential Market Characteristics by Type of Dwelling Unit

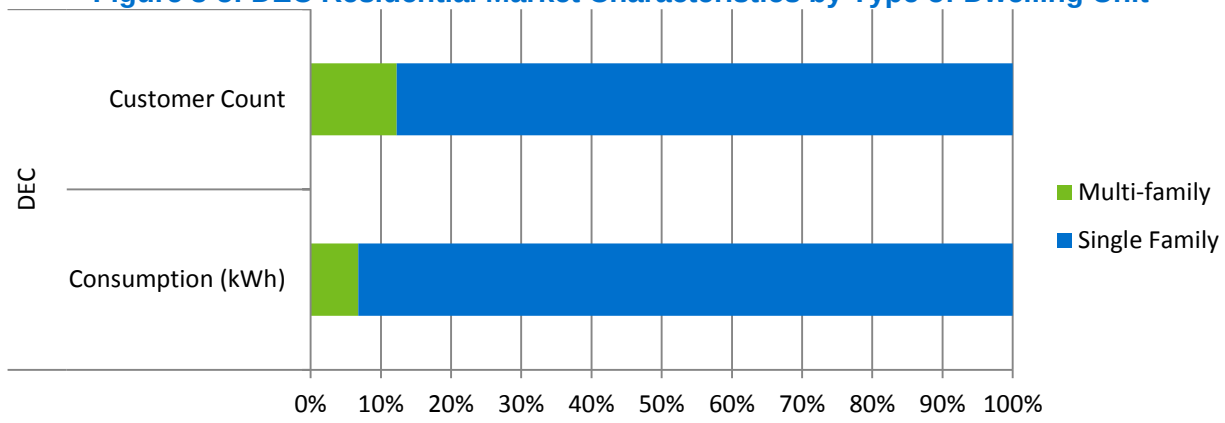
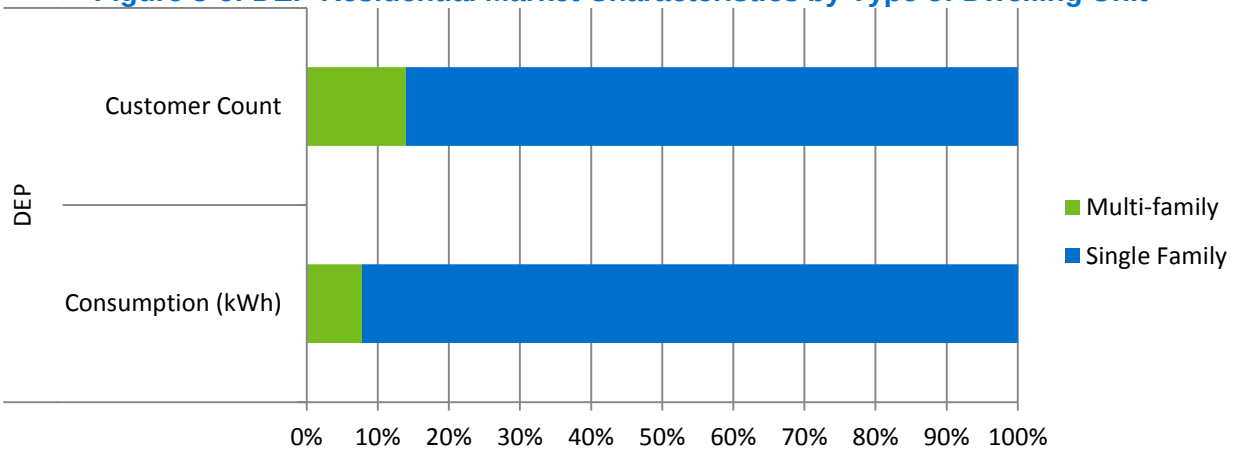


Figure 3-6: DEP Residential Market Characteristics by Type of Dwelling Unit



3.3 DEC Base Year 2016 Disaggregated Load

The DEC's disaggregated loads for the base year 2016 by sector and end use are summarized in Figure 3-7, Figure 3-8 and Figure 3-9.

Figure 3-7: DEC Residential Baseline Load Shares

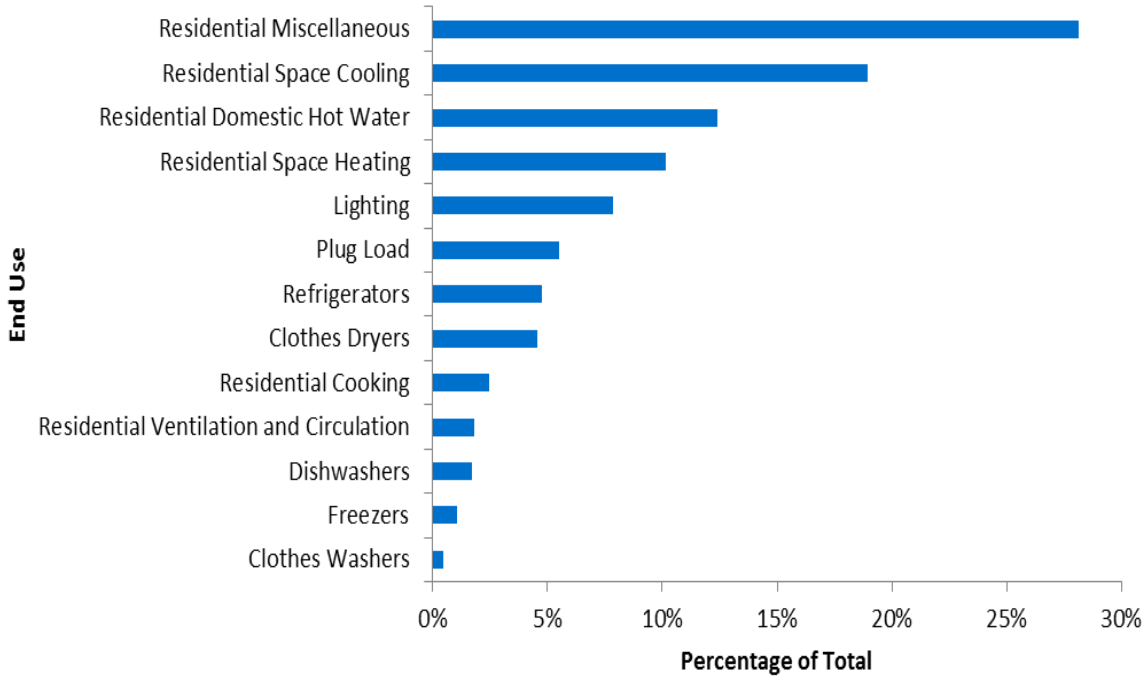


Figure 3-8: DEC Commercial Baseline Load Shares

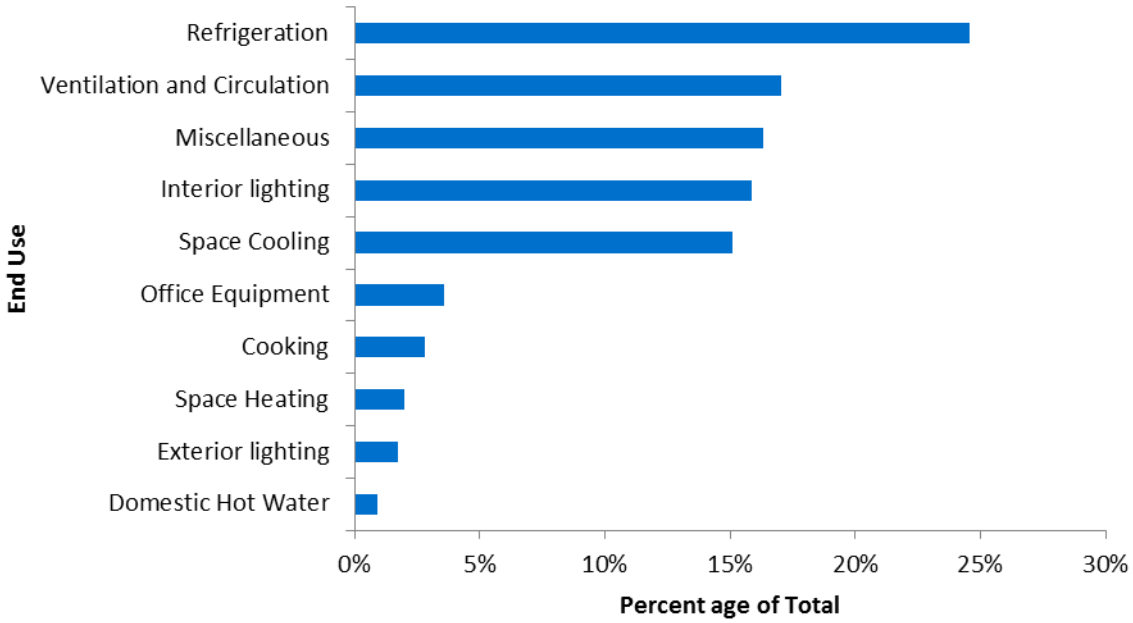
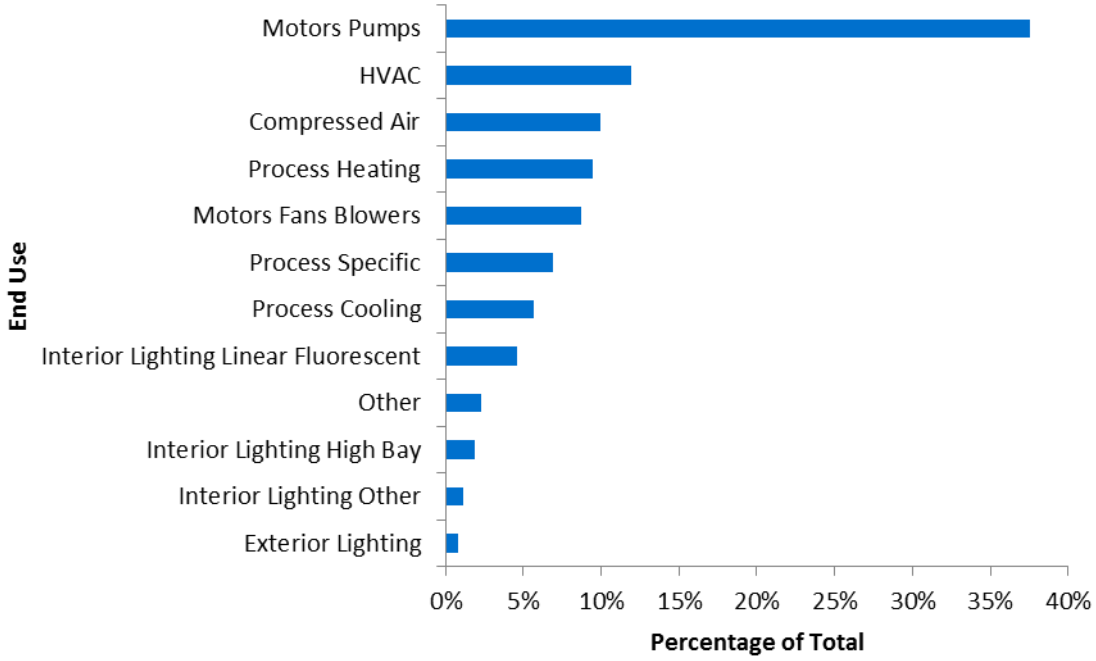


Figure 3-9: DEC Industrial Baseline Load Shares



In the base year 2016, the DEC top load share categories are:

- ***Residential:*** miscellaneous, space cooling, and domestic hot water.
- ***Commercial:*** refrigeration, miscellaneous, and ventilation and circulation.
- ***Industrial:*** motors, HVAC, and compressed air.

3.4 DEP Base Year 2016 Disaggregated Load

The DEC's disaggregated loads for the base year 2016 by sector and end use are summarized in Figure 3-10, Figure 3-11, and Figure 3-12.

Figure 3-10: DEP Residential Baseline Load Shares

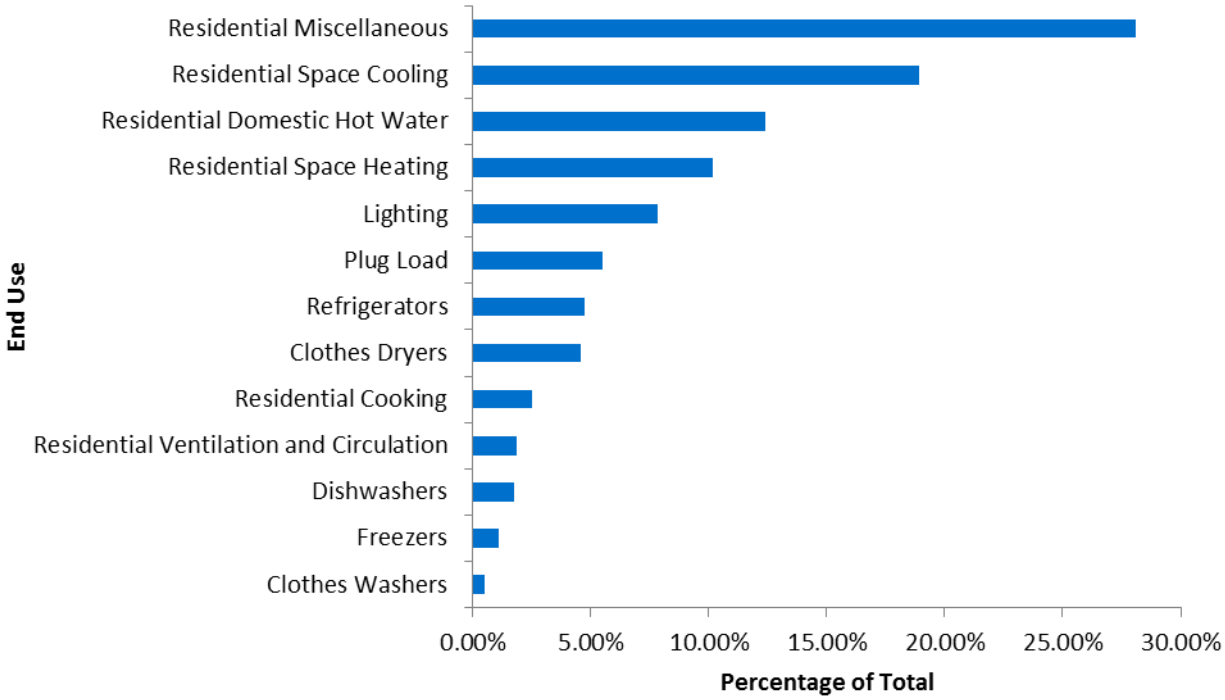


Figure 3-11: DEP Commercial Baseline Load Shares

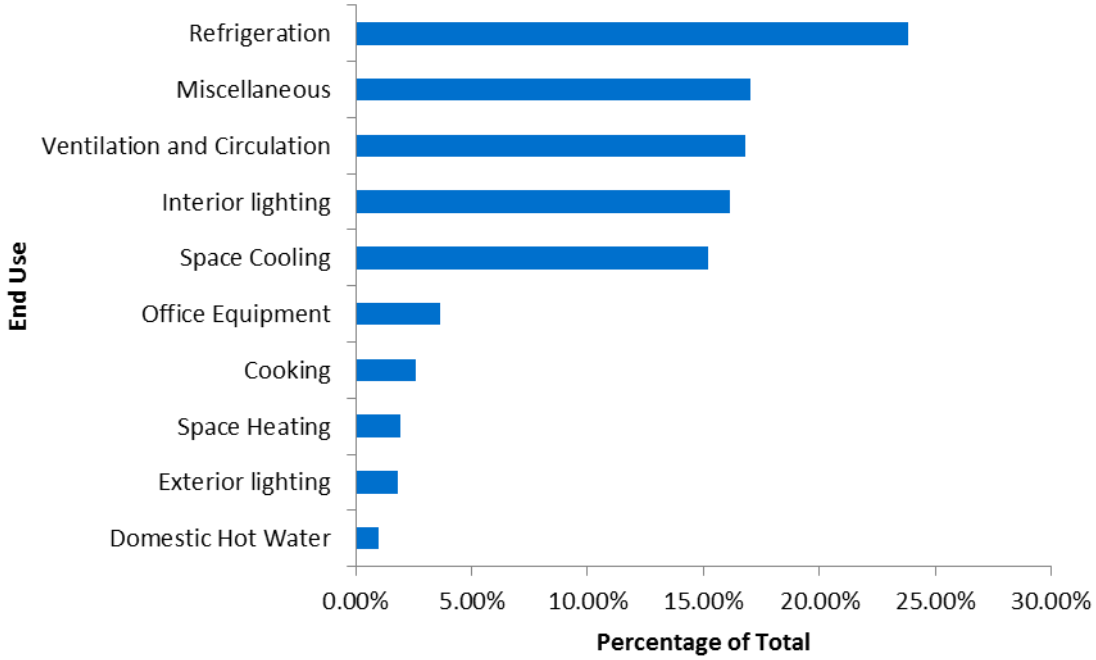
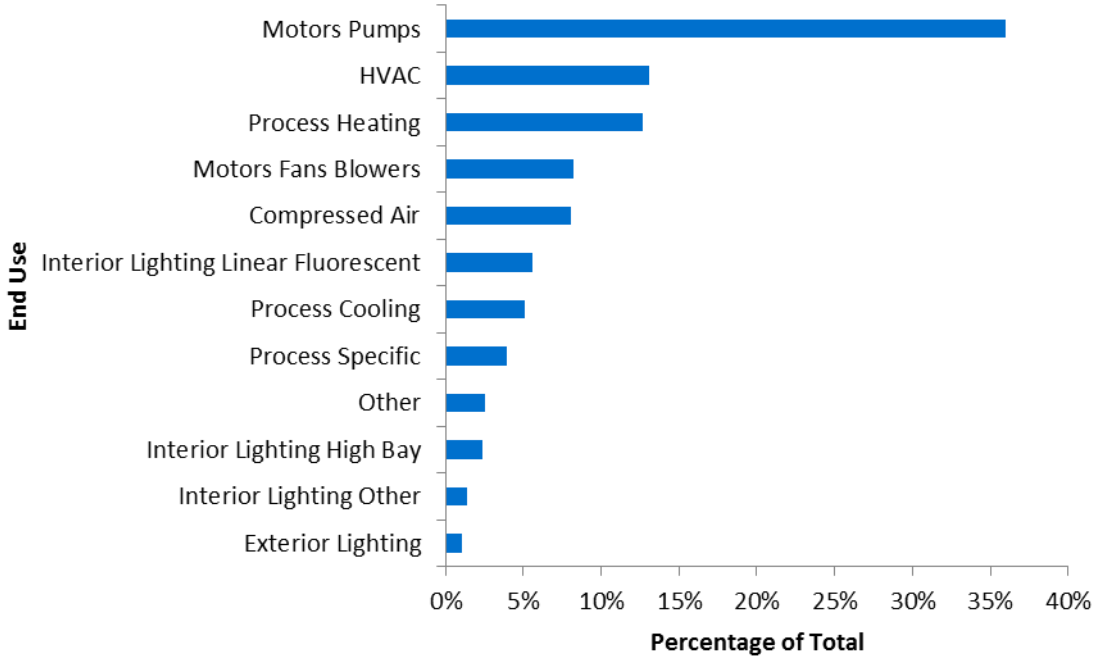


Figure 3-12: DEP Industrial Baseline Load Shares



In the base year 2016, the DEP top load share categories are:

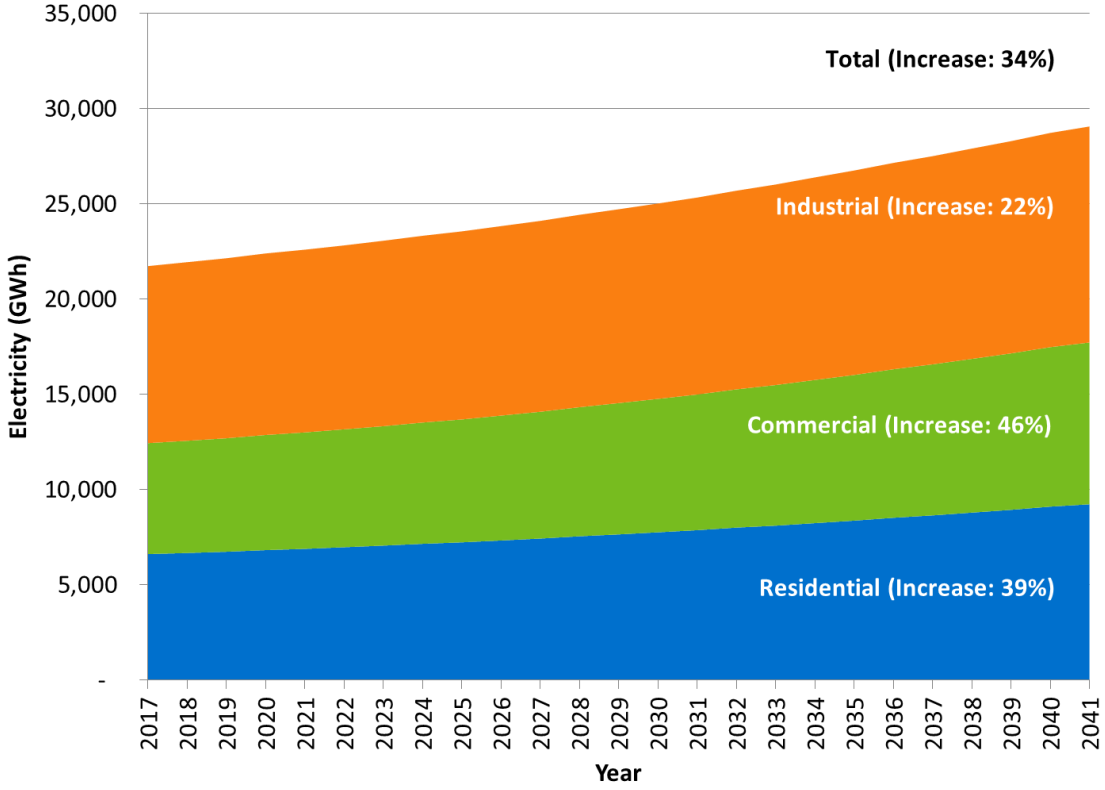
- ***Residential:*** miscellaneous, space cooling, and domestic hot water.
- ***Commercial:*** refrigeration, miscellaneous, and ventilation.
- ***Industrial:*** motors, HVAC, and process heating.

3.5 DEC System Load Forecast 2017 - 2041

3.5.1 DEC System Energy Sales

The DEC electricity use is forecasted to increase by 34% from 2017 to 2041, to a total of 29,068 GWh in 2041 (see Figure 3-13). The commercial sector is expected to account for the largest share of the increase at 2,671 GWh over the 25 year period. In 2041 the commercial sector accounts for 29% (8,497 GWh) of total electricity sales, the residential sector 32% (9,233 GWh) and the industrial sector 39% (11,339 GWh).

Figure 3-13: DEC Electricity Sales Forecast by Sector for 2017 - 2041[11]



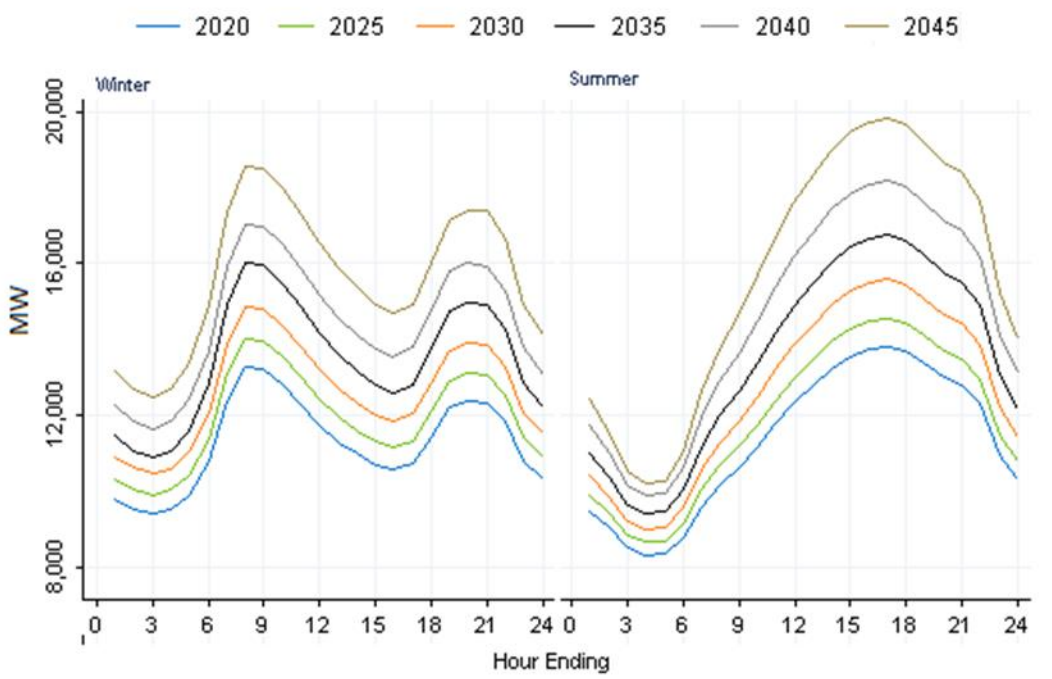
3.5.2 DEC System Demand

Estimating technical potential for demand response resources requires not only knowing how much load is available to be curtailed or shifted, but also understanding when it is needed. Because the benefits of demand response stem from avoiding costly investments to meet peak loads, load reductions will not have any value unless they occur during hours of peak system usage. Therefore, the first order of business in estimating the market potential for demand response is to establish when load reductions will most likely be needed throughout the year.

The primary data source used to determine when demand response resources will be needed was the DEC system load forecast. This forecast contains forecasted loads for all 8,760 hours of each year in the study period (2017-2040, as data for 2041 are missing). Figure 3-14 represents an initial inspection of the data. Each figure shows the expected average load profiles for two distinct types of days – peak summer days and peak winter days. Summer was defined as April-October, while the peak days refer to day with the maximum demand during the year and season.

[11] Sales forecast based on DEC(SC) fall 2015 forecast—the current forecast at the time of Nexant's analysis.

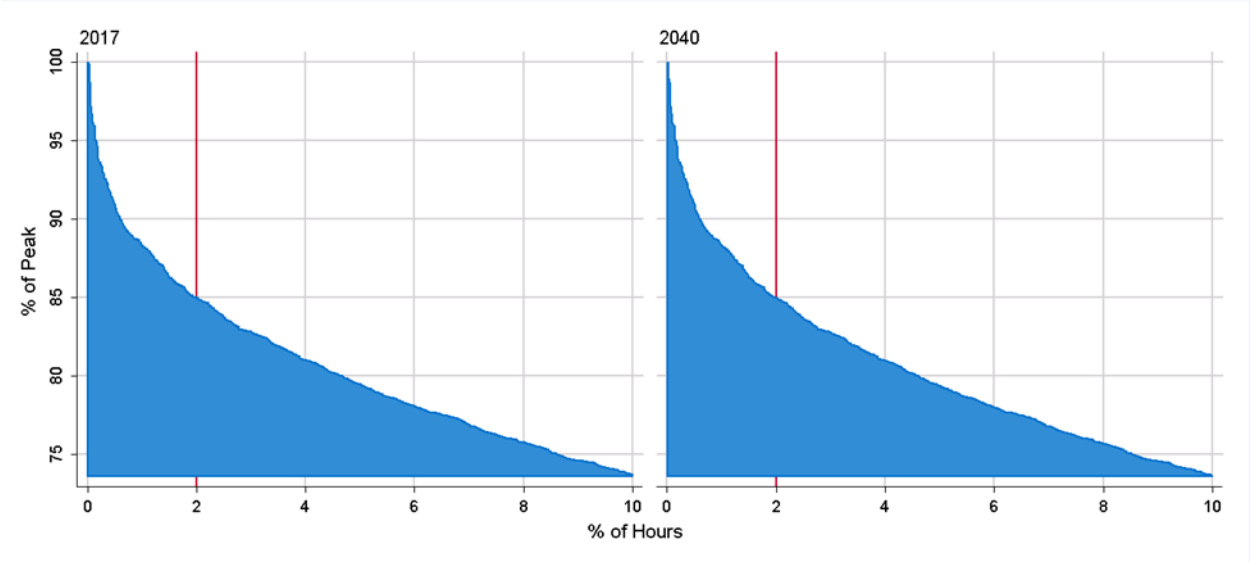
Figure 3-14: DEC System Load Forecast (2017 - 2040)



Several patterns are apparent from examining the figure above. First and foremost, forecasted loads keep constant over time. In addition, the summer loads are substantially higher than winter loads. Thus the potential study focuses on the current summer peak hour, 3-4 pm, and the current winter peak hour, 6-7 am.

Though useful for assessing patterns in system loads, Figure 3-14 does not provide very much information about the concentration of peak loads. A useful tool to examine peak load concentration is a load duration curve, which is presented for 2017 and 2040 in Figure 3-15. This curve shows the top 10% of hourly loads as a percentage of the system's peak hourly usage, sorted from highest to lowest.

Figure 3-15: DEC Forecasted Load Duration Curve (2017 v 2040)



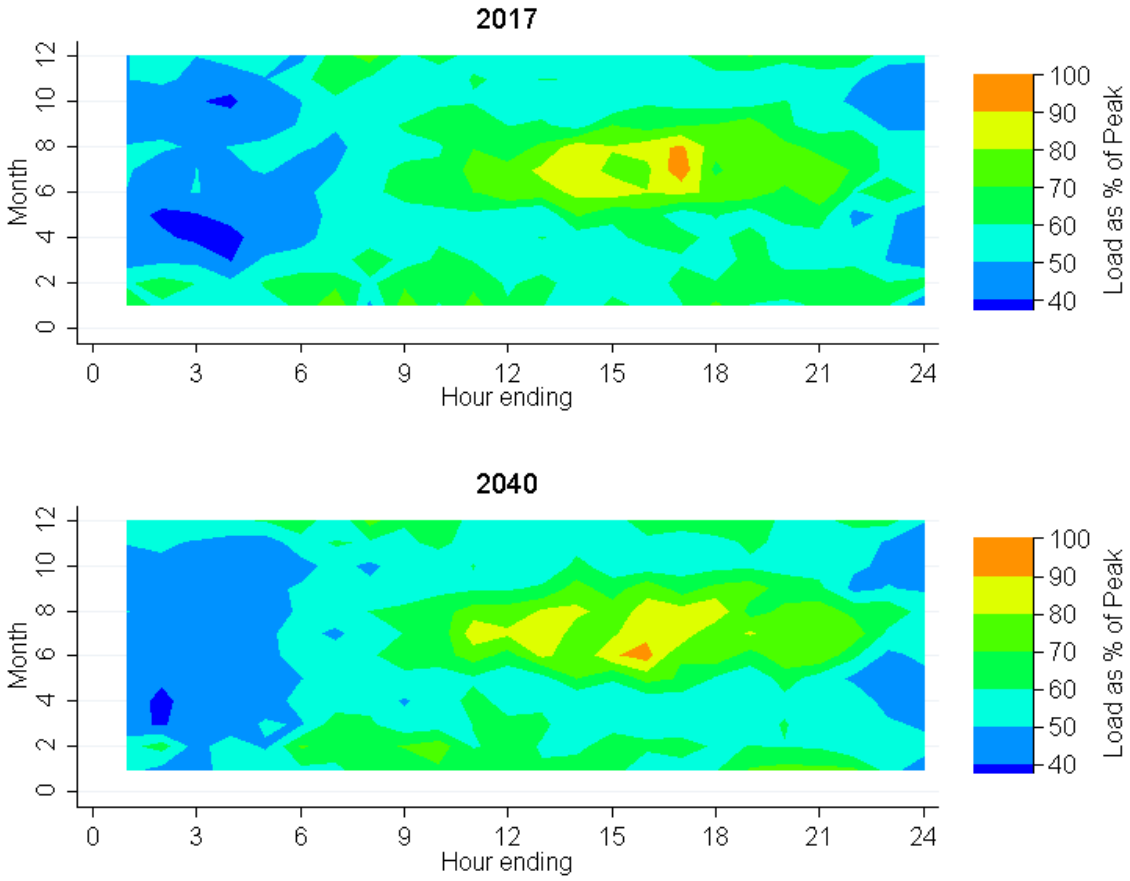
The x-axis in Figure 3-15 is depicted as the cumulative percentage of hours. The red line drawn at 2% serves as a helpful reference point for interpretation by showing the amount of peak capacity needed to serve the 2% of hours with the highest usage.[12] The DEC system currently uses 15% of peak capacity to serve only 2% of hours, and are projected to remain the same by 2041.

Another valuable tool for studying peak loads is a contour plot. Often referred to as “heat maps”, these plots show frequencies or intensities of a particular variable for different combinations of two other variables. Figure 3-16 contains the same hourly data as a percentage of peak system load that is presented in Figure 3-15; however, it shows the months and hours when each hourly load occurs for all hours instead of only the top 10% of hours.

The results in Figure 3-16 show the highest hours of usage are concentrated in summer evening hours. Actual weather patterns reflect year to year variation in loads and, depending on the extreme temperatures for a year, winter peaks can still be of concern. Another consideration is market prices, which can be high in winter if natural gas is used both for heating and electricity generation.

[12] Another interpretation of the load duration curve data would be the amount that peak load capacity could be reduced by shaving demand during 2% of the hours throughout the year.

Figure 3-16: Forecasted Patterns in DEC System Load (2017 vs 2040)

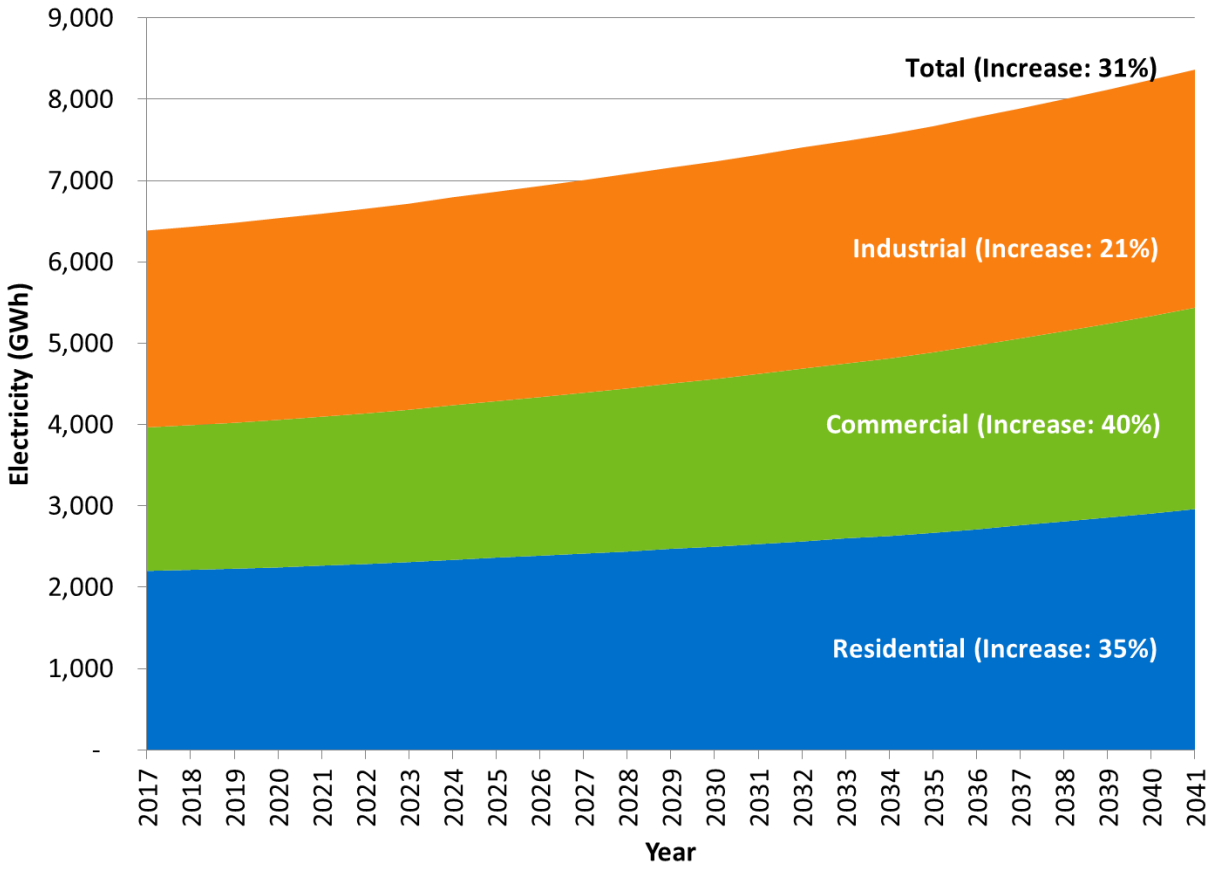


3.6 DEP System Load Forecast 2017 - 2041

3.6.1 DEP System Energy Sales

The DEP electricity use is forecasted to increase by 31% from 2017 to 2041, to a total of 8,365 GWh in 2041 (see Figure 3-17). The residential sector is expected to account for the largest share of the increase at 760 GWh over the 25 year period. In 2041 the residential sector accounts for 35% (2,961 GWh) of total electricity sales, the commercial sector 30% (2,477 GWh) and the industrial sector 35% (2,927 GWh).

Figure 3-17: DEP Electricity Sales Forecast by Sector for 2017 - 2041[13]

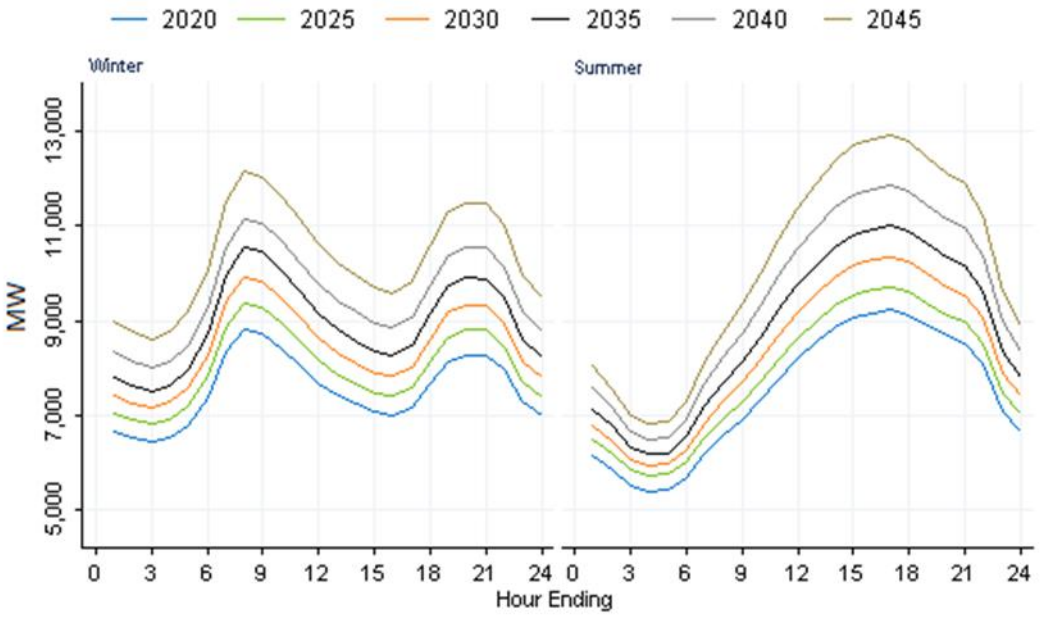


3.6.2 DEP System Demand

The primary data source used to determine when demand response resources will be needed was the DEP system load forecast. This forecast contains forecasted loads for all 8,760 hours of each year in the study period (2017-2041). Figure 3-18 represents an initial inspection of the data. Each figure shows the expected average load profiles for two distinct types of days – peak summer days and peak winter days. Summer was defined as April-October, while the peak days refer to day with the maximum demand during the year and season.

[13] Sales forecast based on DEP(SC) fall 2015 forecast—the current forecast at the time of Nexant's analysis.

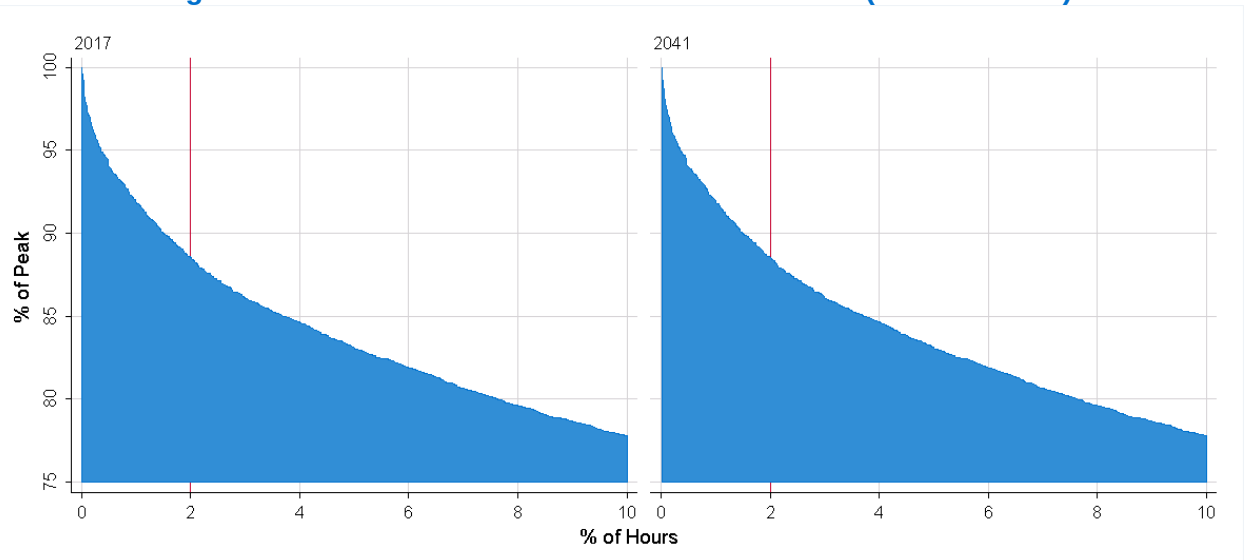
Figure 3-18: DEP System Load Forecast (2017 - 2041)



Several patterns are apparent from examining the figure above. First and foremost, forecasted loads keep constant over time. In addition, the fluctuation of summer loads is substantially higher than the one of winter loads. Thus the potential study focuses on the current summer peak hour, 3-4 pm, and the current winter peak hour, 7-8 am.

The DEP load duration curve is presented for 2017 and 2041 in Figure 3-19. This curve shows the top 10% of hourly loads as a percentage of the system's peak hourly usage, sorted from highest to lowest.

Figure 3-19: DEP Forecasted Load Duration Curve (2017 vs. 2041)

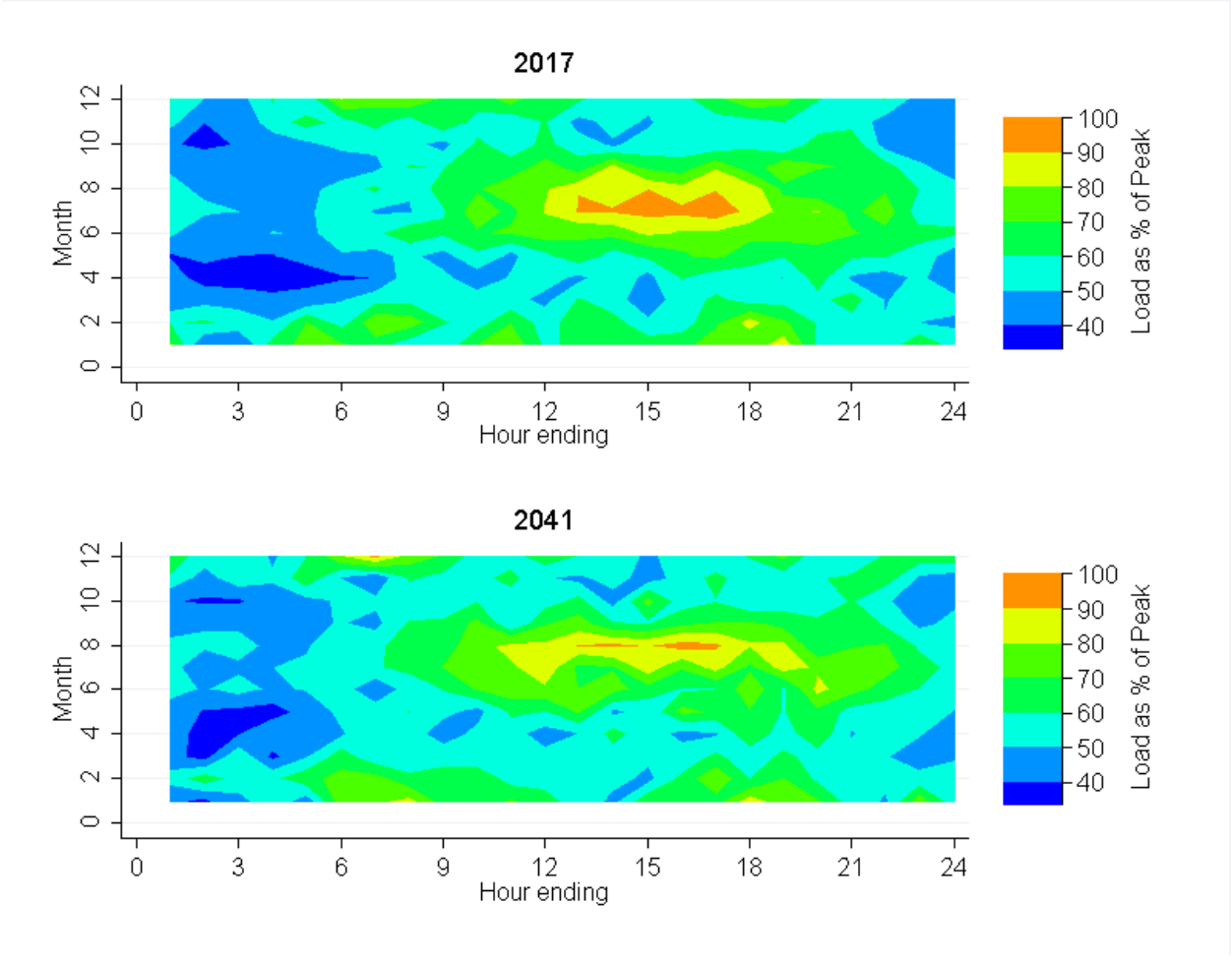


The x-axis in Figure 3-19 is depicted as the cumulative percentage of hours. The red line drawn at 2% serves as a helpful reference point for interpretation by showing the amount of peak capacity needed to serve the 2% of hours with the highest usage.[14] The DEP system currently uses 12% of peak capacity to serve only 2% of hours, and is projected to remain the same by 2041.

Another valuable tool for studying peak loads is a contour plot. Often referred to as "heat maps", these plots show frequencies or intensities of a particular variable for different combinations of two other variables. Figure 3-20 contains the same hourly data as a percentage of peak system load that is presented in Figure 3-19; however, it shows the months and hours when each hourly load occurs for all hours instead of only the top 10% of hours.

The results in Figure 3-20 show the highest hours of usage are concentrated in summer evening hours. Actual weather patterns reflect year to year variation in loads and, depending on the extreme temperatures for a year, winter peaks can still be of concern. Another consideration is market prices, which can be high in winter if natural gas is used both for heating and electricity generation.

Figure 3-20: Forecasted Patterns in DEP System Load (2017 vs 2041)



[14] Another interpretation of the load duration curve data would be the amount that peak load capacity could be reduced by shaving demand during 2% of the hours throughout the year.

3.6.3 Customer Opt-Outs

Duke Energy's energy efficiency programs in South Carolina include an "opt-out" provision approved by the Public Service Commission of South Carolina. This provision allows "manufacturing industry" customers with more than 50% of their electric energy consumption being used for its manufacturing process, and commercial class customers with annual energy consumption of million kWh or greater, to opt out, which exempts the customer from cost recovery mechanism but also eliminates that customer's eligibility for participation in the program.

In order to incorporate the impact of opt-outs into the study, Duke provided Nexant with current opt-out information in South Carolina, which showed an opt-out rate of approximately 56% of non-residential kWh sales in the DEC service territory and 64% non-residential DEP sales. Nexant incorporated this opt-out rate into the model by reducing the non-residential sales estimates by the appropriate percentage for each service territory and applying the applicable energy efficiency technologies and market adoption rates to the remaining sales forecast.

4 DSM Measure List

Determining the list of demand-side management (DSM) measures to include in the MPS was a key effort in determining the market potential. This section presents the methodology to develop the measure list and discusses the energy efficiency and demand response services and products.

4.1 Methodology

Nexant identified DSM measures for consideration in the MPS by initially examining a list of proposed measures provided by Duke Energy, which included all Duke Energy measures currently offered by existing programs as well as measures that Duke Energy developed following its own gap analysis of program offerings.

Nexant reviewed the list to determine its alignment with the granularity required for the potential study analysis and to develop an initial qualitative screening for applicability in the South Carolina territories. Nexant also reviewed the Duke Energy program measure lists against the Nexant DSM measure library to ensure that the study covered a robust and comprehensive set of measures, and supplemented the list with Nexant-identified measures where appropriate.

The final measure list included energy efficiency technologies, and products that enable DR opportunities. DR initiatives that do not rely on installing a specific technology or measure (such as a voluntary curtailment program) are not reflected in the measure list. See Appendix A for the final measure list. Detailed measure workbooks in Excel format were provided to Duke Energy.

4.2 Energy Efficiency Measures

Nexant found that many of the individual measures in the Duke Energy list of existing program measures were actually detailed permutations of general measure opportunities. For example, the Duke Energy list contained multiple instances of CFL lamps with varying characteristics (candelabra base, globe base, A-line, etc.). Although these distinctions were important during program delivery, Nexant did not need this level of granularity to identify the market potential for a particular technology. In developing the final list of measures, Nexant captured the collective savings opportunities associated with specific measures by using more general measure designations.

Nexant also used a qualitative screening approach to address the applicability of measures to the South Carolina service territories. The qualitative screening criteria that Nexant used included: difficult to quantify savings, no longer current practice, better measure available, immature or unproven technology, limited applicability, poor customer acceptance, health and environmental concerns, and end-use service degradation.

A workbook was developed for each measure and the workbooks included the following:

- Classification of measure by type, end use, and subsector
- Measure life
- Description of the base-case scenario, and the primary- and secondary-efficiency cases
- Input values for variables used to calculate energy savings
- Savings algorithms and calculations per subsector, taking weather zones and subsectors into consideration
- Measure costs
- References and supporting information
- Output to be used as input in Nexant's TEA-POT model.

As shown in Table 4-1, the study included 337 unique energy-efficiency measures. Expanding the measures to account for all appropriate combinations of segments, end uses, and construction types resulted in 16,952 measure permutations. Appendix B includes the final measure list used for the study.

Table 4-1: EE Measure Counts by Sector

Sector	Unique Measures	Permutations
Residential	101	1,536
Commercial	138	12,544
Industrial	98	2,872

4.3 DR Services and Products

Nexant and Duke Energy worked together to determine which DR products and services were included in the MPS, and addressed the following:

- **Direct load control.** Customers receive incentive payments for allowing the utility a degree of control over equipment, such as air conditioners or water heaters
- **Emergency load response.** Customers receive payments for committing to reduce load if called upon to do so by the grid operator
- **Economic load response:** Utilities provide customers with incentives to reduce energy consumption when marginal generation costs are higher than the incentive amount required to achieve the needed energy reduction
- **Base interruptible DR**. Customers receive a discounted rate for agreeing to reduce load to a firm service level upon request
- **Critical peak rebate.** Customers are provided a financial incentive for load reductions they voluntarily achieve during specified hours.
- **Behavioral DR**. Customers voluntarily reduce load during specific hours based on utility request.

5 Technical Potential

In the previous sections, energy efficiency measures were identified and characterized (Section 0), and the 2016 base year load shares and reference-case load forecast for 2017 to 2041 were developed. The outputs from these tasks provided the input for estimating the technical potential scenario, which is discussed in this section.

The technical potential scenario estimates the savings potential when all technically feasible energy efficiency measures are implemented at their full market potential, while taking equipment turnover rates into account. This savings potential can be considered as a maximum potential.

The subsequent sections discuss the development of the economic and program achievable potential scenarios.

5.1 Methodology

5.1.1 Energy Efficiency

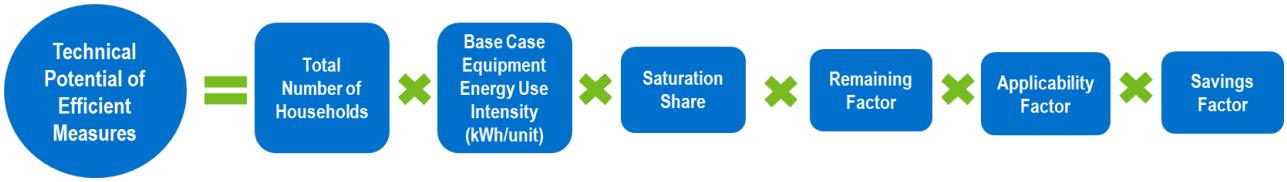
Energy efficiency technical potential provides a theoretical maximum for electricity savings. Technical potential ignores all non-technical constraints on electricity savings, such as cost-effectiveness and customer willingness to adopt energy efficiency. For an electricity potential study, technical potential refers to delivering less electricity to the same end uses. In other words, technical potential might be summarized as “doing the same thing with less energy, regardless of the cost.”

The potential estimate applied DSM measures to the disaggregated South Carolina electricity sales forecasts to estimate technical potential. This involved applying estimated energy savings from equipment or non-equipment measures to all electricity end uses and eligible customers[15]. Since technical potential does not consider the costs or time required to achieve these electricity savings, the estimates provide an upper limit on savings potential. Technical potential consists of the total electricity that can be saved in the market. Nexant reported technical potential as a single numerical value for the DEC service territory and for the DEP service territory.

The core equation used in the residential sector energy efficiency technical potential analysis for each individual efficiency measure is shown in Equation 5-2 below, while the core equation used in the nonresidential sector technical potential analysis for each individual efficiency measure is shown in Equation 5-1below.

[15] Excludes portion of non-residential customer who have opted out of energy efficiency programs, as described in Section 3.6.3

Equation 5-1: Core Equation for Residential Sector Technical Potential



Where:

Base Case Equipment Energy Use Intensity = the electricity used per customer per year by each base-case technology in each market segment. In other words, the base case equipment energy-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.

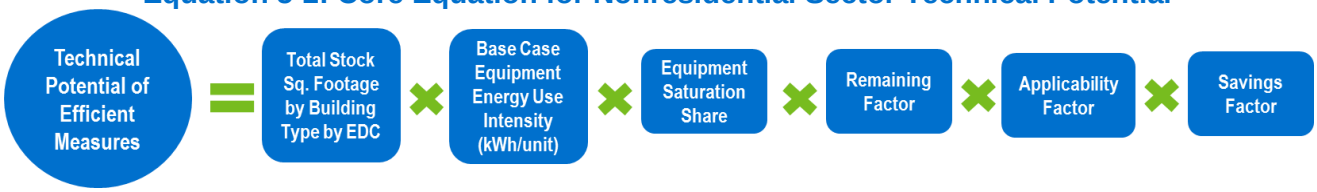
Saturation Share = the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential water heating, the saturation share would be the fraction of all residential electric customers that have electric water heating in their household.

Remaining Factor = the fraction of equipment that is not considered to already be energy efficient. To extend the example above, the fraction of electric water heaters that is not already energy efficient.

Applicability Factor = the fraction of units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (i.e., it may not be possible to install CFLs in all light sockets in a home because the CFLs may not fit in every socket).

Savings Factor = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

Equation 5-2: Core Equation for Nonresidential Sector Technical Potential



Where:

Total Stock Square Footage by Building Type = the forecasted square footage level for a given building type (e.g., square feet of office buildings).

Base Case Equipment Energy Use Intensity = the electricity used per square foot per year by each base-case equipment type in each market segment.

Equipment Saturation Share = the fraction of total end use energy consumption associated with the efficient technology in a given market segment. For example, for room air conditioners, the saturation share would be the fraction of all space cooling kWh in a given market segment that is associated with room air conditioner equipment.

Remaining Factor = the fraction of equipment that is not considered to already be energy efficient. For example, the fraction of electric water heaters that is not already energy efficient.

Applicability Factor = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (i.e., it may not be possible to install VFDs on all motors in a given market segment).

Savings Factor = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

It is important to note that the technical potential estimate represents electricity savings potential at a specific point in time. In other words, the technical potential estimate is based on data describing *status quo* customer electricity use and technologies known to exist today. As technology and electricity consumption patterns evolve over time, the baseline electricity consumption will also change accordingly. For this reason, technical potential is a discrete estimate of a dynamic market. Nexant reported technical potential at a given point in time, based on currently known DSM measures and observed electricity consumption patterns.

Addressing Naturally-Occurring Energy Efficiency

Because the anticipated impacts of efficiency actions that may be taken even in the absence of utility intervention are included in the baseline forecast, savings due to naturally-occurring efficiency were considered separately in the potential estimates. Nexant worked with Duke Energy's forecasting group to ensure that the sales forecasts incorporated two known sources of naturally-occurring efficiency:

- **Codes and Standards:** The sales forecasts incorporated the impacts of known code changes. While some code changes have relatively little impact on overall sales, others—particularly the Energy Independence and Security Act (EISA) and other federal legislation—will have noticeable influence.
- **Baseline Measure Adoption:** Sales forecasts typically exclude the projected impacts of future DSM efforts, but account for baseline efficiency penetration (this can be a delicate process given that some of these adopters are likely programmatic free-riders).

By properly accounting for these factors, the potential study estimated the net penetration rates, representing the difference between the anticipated adoption of efficiency measures as a result of DSM efforts and the "business as usual" adoption rates absent DSM intervention. This is true even in the technical and economic scenarios, where adoption was assumed to be 100%, and was particularly important in the achievable potential analysis, where Nexant estimated the measure

adoption and associated savings that can be expected to occur above baseline measure adoption rates.

5.1.2 Demand Response

The concept of technical potential differs when applied to demand response. Technical potential for demand response is effectively the magnitude of loads that can be managed during conditions when grid operators need peak capacity, ancillary services, or when wholesale energy prices are high. Which accounts consume electricity at those times? What end uses describe consumption during these time periods? Can those end use loads be reduced? Large C&I accounts generally do not provide the utility with direct control over end-uses; nevertheless, for enough money, businesses will forego virtually all electricity consumption temporarily. For residential and small C&I accounts where DR generally takes the form of direct utility control, technical potential for demand response is limited by the loads that can be controlled remotely at scale.

This framework makes end use disaggregation an important element for understanding DR potential, particularly in the residential and SMB sectors. As the technology to actively manage loads becomes more advanced over the study horizon, accurate end use load disaggregation will be increasingly important. End use load disaggregation not only provides insights into which loads are on and off when specific grid services are needed, but also provides insight concerning how end use consumption varies across customers. The approach used for load disaggregation is more advanced than what is used for most potential studies. Instead of disaggregating annual consumption or peak demand, Nexant produced end-use load disaggregation for all 8,760 hours in a year. This was needed because the loads available at times when different grid applications are needed can vary substantially. This allows Nexant to identify which customers were cost-effective to recruit for DSM programs.

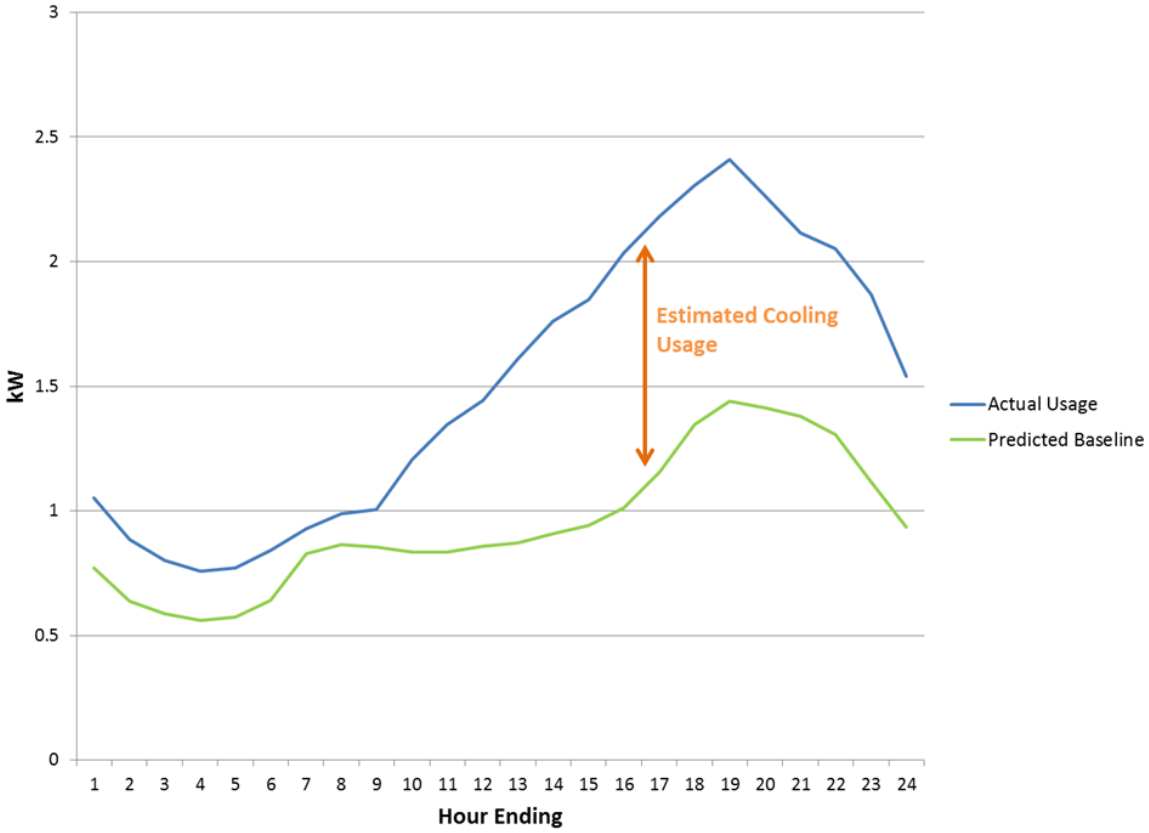
To determine what curtailable load is available during system peaks, Nexant analyzed interval data for all large C&I customers and relied on average load shapes from load research samples as the starting point for analysis of residential and smaller C&I customers. In the context of this study, DR capacity is defined as the amount of curtailable load that is available during the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter capacity.

As previously mentioned, all large C&I load is considered dispatchable, while residential and SMB DR capacity is based on specific end uses. “Dispatchable” loads are those that can be directly and centrally controlled by a utility (subject to customers’ permission) For this study, Nexant assumed that summer DR capacity for residential customers would be comprised of AC, pool pumps, and water heaters. For SMB customers, summer capacity was based on AC load. For winter capacity, residential DR capacity was based on electric heating loads and water heaters. For SMB customers, winter capacity was based on heating load.

AC and heating load profiles were generated for residential and SMB customers using the load research sample provided by Duke. The aggregate load profile for each customer class was

combined with historical weather data, and used to estimate hourly load as a function of weather conditions. AC and heating loads were estimated by calculating the baseline load on days when cooling degree days (CDD) and heating degree days (HDD) were equal to zero, then by subtracting this baseline load from the load that occurred on days when temperatures were more extreme. This methodology is illustrated by Figure 5-1.

Figure 5-1: Methodology for Estimating Cooling Loads



This method was only able to produce estimates for average AC/heating load profiles for the residential and SMB sector as a whole (the load research samples provided were at an aggregate level), so billing data for 2013 through 2015 were used to scale these load profiles for more granular segmentations within each customer class. Similar to the process applied to the interval data, the billing data for each segment (building type and consumption decile for residential customers, and industry for SMB customers) were combined with historical weather data to build a regression model that estimates monthly consumption for each segment as a function of total CDD and HDD. The consumption attributable to heating and cooling loads was estimated by establishing a baseline of consumption for each segment when CDD and HDD were equal to zero, and finding the difference between the actual consumption and the baseline.

These calculations were used to estimate the relative contribution of each customer segment to the total cooling and heating load for the residential and SMB sectors. Using these relative contributions,

the overall residential and SMB cooling and heating load profiles were scaled for each customer segment.

Profiles for residential water heater and pool pump loads were estimated by utilizing end use load data from CPS Energy's Home Manager Program. Consumption associated with these end uses is fairly similar across different geographic regions; so data from CPS Energy's territory in San Antonio were considered a valid proxy. The only difference was that pool pump loads were assumed to be zero in the winter season for DEC and DEP, whereas these loads are fairly constant year round for CPS Energy.

For all eligible loads, the technical potential was defined as the amount that was coincident with system peak hours for each season. System peak hours were identified using 2014 system load data. The 2014 summer peak for DEC territory occurred July 14th during hour ending 15. The 2014 summer peak for DEP territory occurred September 2nd during hour ending 15. The 2014 winter peak for DEC territory occurred January 30th during hour ending 7. The 2014 winter peak for DEP territory occurred January 7th during hour ending 8.

5.2 DEC Energy Efficiency Technical Potential

This section provides the results of the DEC and DEP energy efficiency technical potential for each of the three segments.

5.2.1 Summary

Table 5-1 summarizes the energy efficiency technical potential by sector and levelized cost associated with the identified potential:

Table 5-1: DEC Energy Efficiency Technical Potential by Sector

Sector	Potential (2017-2041)			
	Energy (GWh)	% of 2041 Base Sales[16]	Demand (MW)	Levelized Cost[17] ($/kWh)
Residential	3,045	33%	930	$0.663
Commercial	1,289	15%	165	$0.216
Industrial	1,526	13%	275	$0.107
Total	5,859	20%	1,370	$0.417

5.2.2 Sector Details

Figure 5-2 summarizes the DEC residential sector energy efficiency technical potential by end use.

[16] Energy savings as a percentage of base sales includes savings impacts that incorporate program opt outs by a portion of eligible commercial and industrial sector customers, as described in Section 3.6.3, compared with total sales forecast for residential, commercial, and industrial sectors.

[17] Levelized cost presented from the TRC perspective. Technical potential costs include incremental measure costs.

Figure 5-2: DEC Residential EE Technical Potential– Cumulative 2041 by End-Use

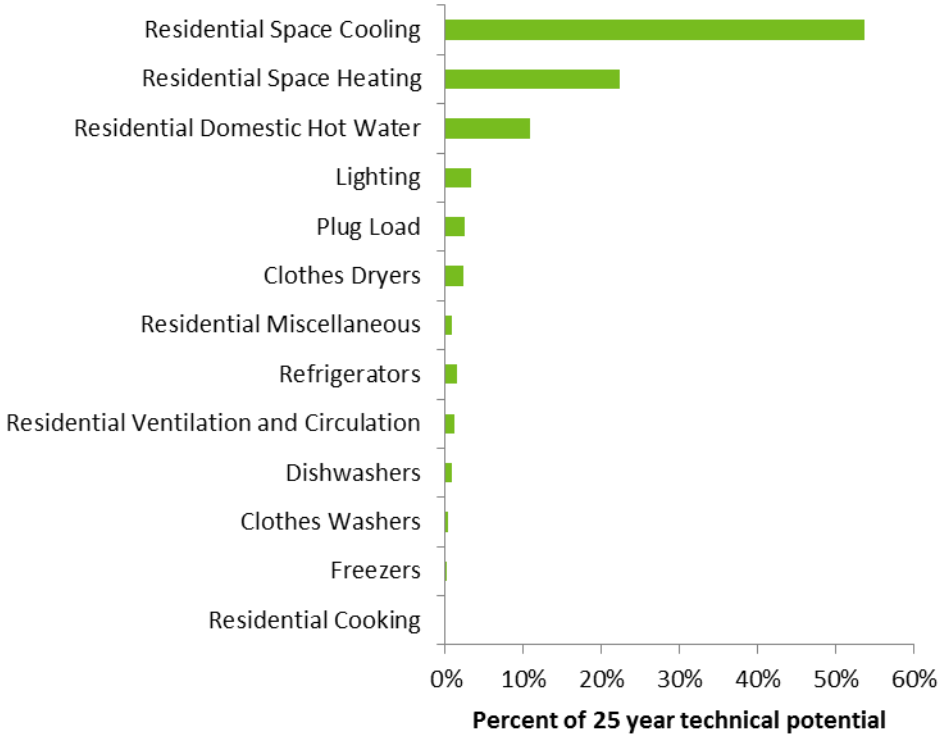


Figure 5-3 summarizes the DEC commercial sector EE technical potential by end use.

Figure 5-3: DEC Commercial EE Technical Potential – Cumulative 2041 by End-Use

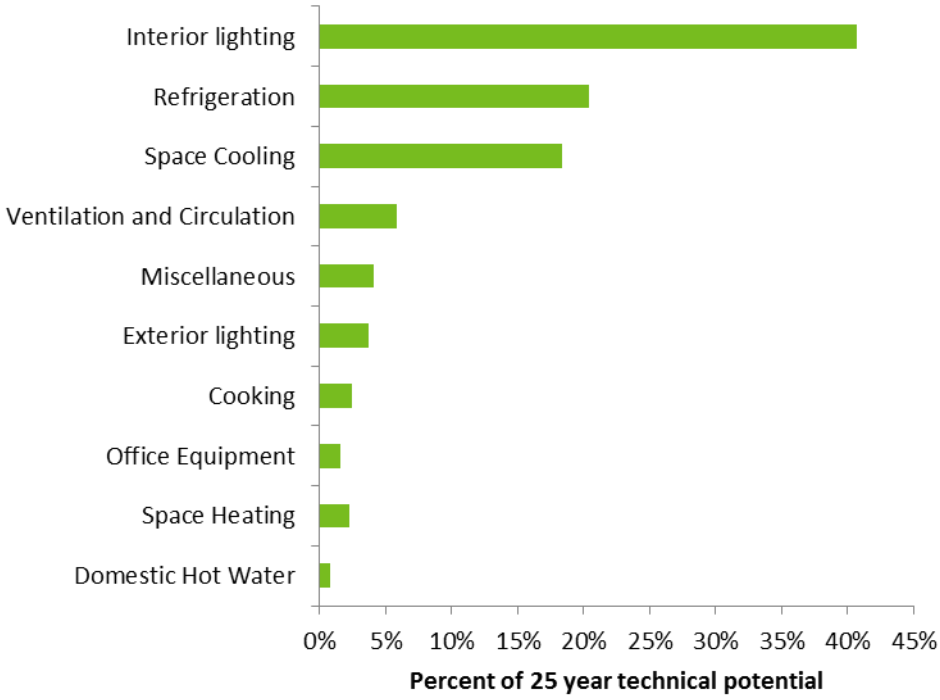


Figure 5-4 provides a summary of DEC energy efficiency technical potential contributions by commercial facility types analyzed in this study.

Figure 5-4: DEC Commercial EE Technical Potential Segment

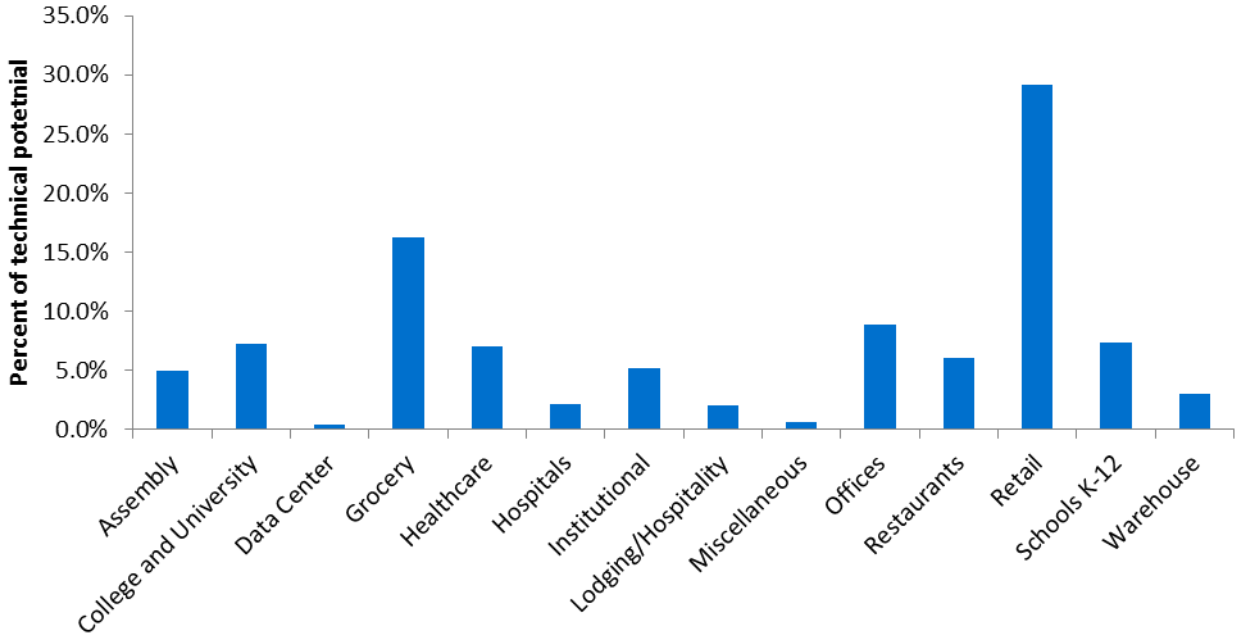


Figure 5-5 summarizes the DEC industrial sector energy efficiency technical potential by end use.

Figure 5-5: DEC Industrial EE Technical Potential – Cumulative 2041 by End-Use

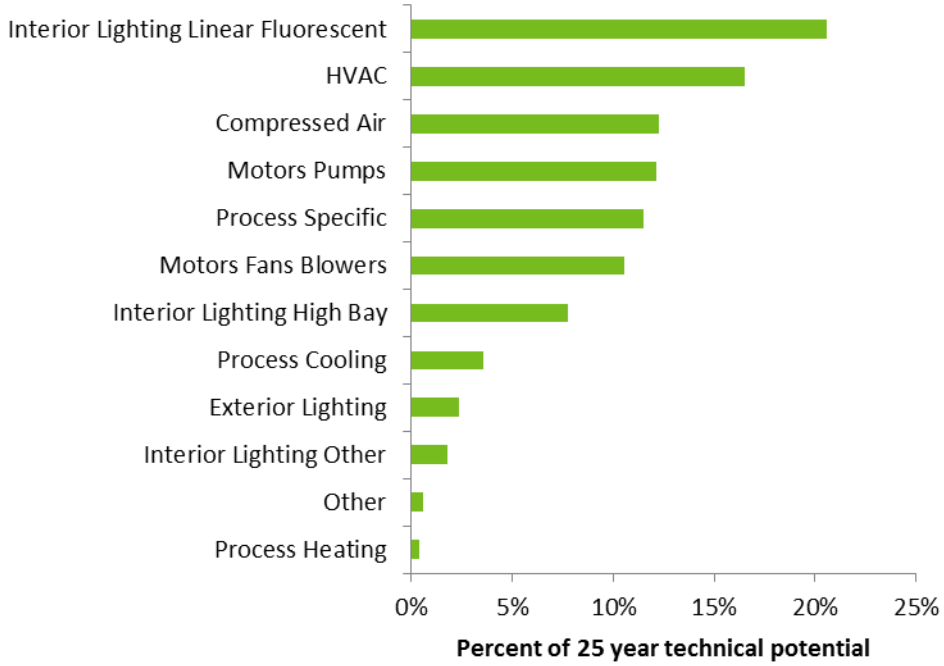
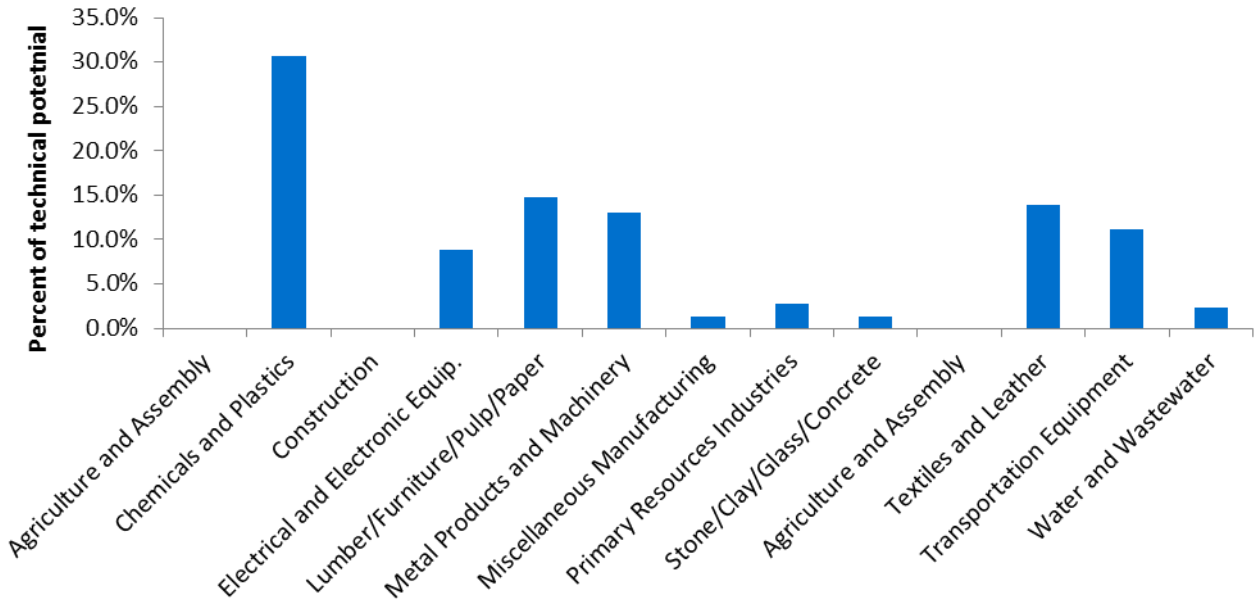


Figure 5-6 provides a summary of DEC energy efficiency technical potential contributions by industrial facility types analyzed in this study.

Figure 5-6: DEC Industrial EE Technical Potential Segment



5.3 DEP Energy Efficiency Technical Potential

This section provides the results of the DEP energy efficiency technical potential for each of the three segments.

5.3.1 Summary

Table 5-2: DEP Energy Efficiency Technical Potential by Sector summarizes the DEP energy efficiency technical potential by sector and levelized cost associated with the identified potential:

Table 5-2: DEP Energy Efficiency Technical Potential by Sector

Sector	Potential (2017-2041)			
	Energy (GWh)	% of 2041 Base Sales[18]	Demand (MW)	Levelized Cost ($/kWh)
Residential	1,025	35%	257	$0.673
Commercial	314	13%	21	$0.197
Industrial	327	11%	62	$0.101
Total	1,667	20%	340	$0.462

[18] Energy savings as a percentage of base sales includes savings impacts that incorporate program opt outs by a portion of eligible commercial and industrial sector customers, as described in Section 3.6.3, compared with total sales forecast for residential, commercial, and industrial sectors.

5.3.2 Sector Details

Figure 5-7 summarizes the DEP residential sector EE technical potential by end use.

Figure 5-7: DEP Residential EE Technical Potential – Cumulative 2041 by End-Use

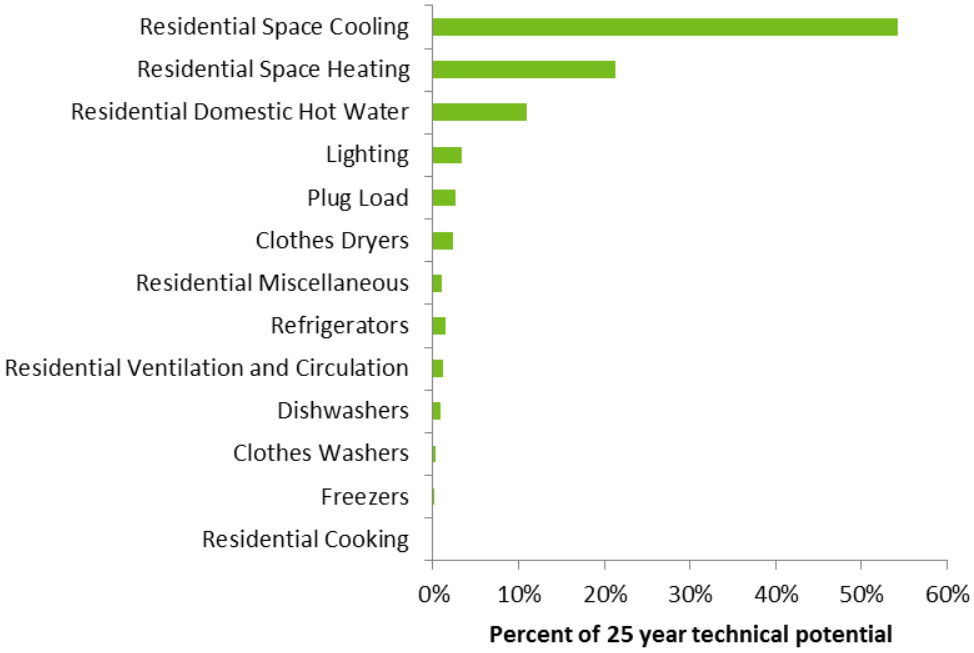


Figure 5-8 summarizes the DEP commercial sector energy efficiency technical potential by end use.

Figure 5-8: DEP Commercial EE Technical Potential – Cumulative 2041 by End-Use

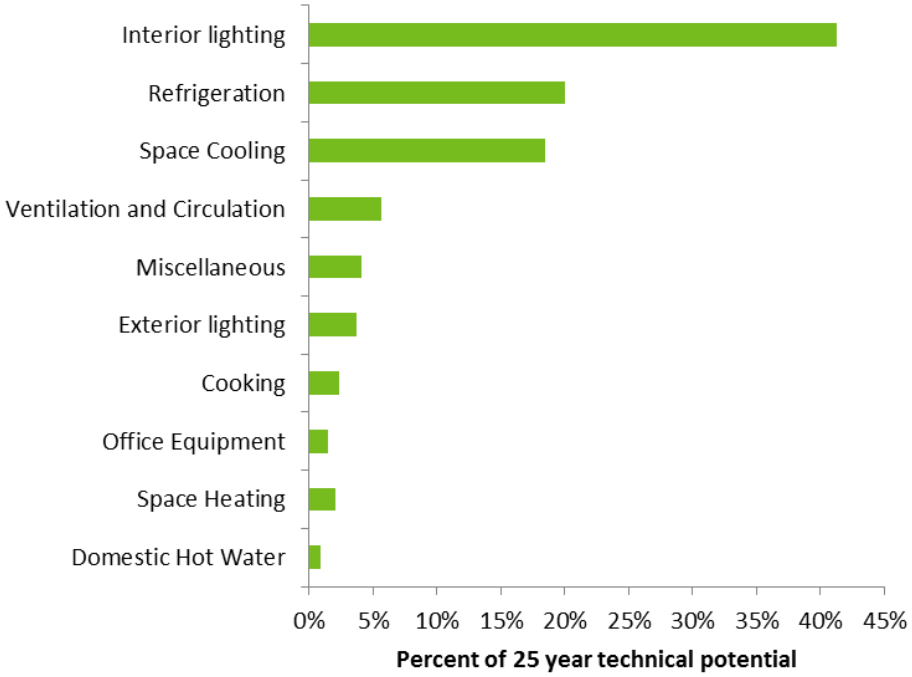


Figure 5-9 provides a summary of DEP energy efficiency technical potential contributions by commercial facility types analyzed in this study.

Figure 5-9: DEP Commercial EE Technical Potential Segment

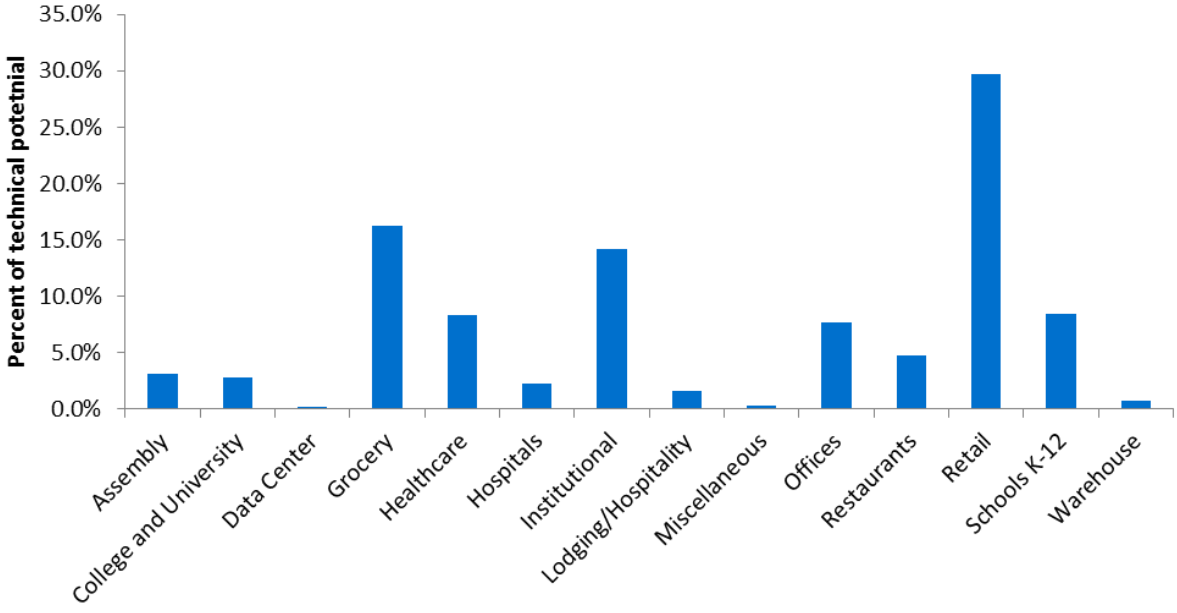


Figure 5-10 summarizes the DEP industrial sector energy efficiency technical potential by end use.

Figure 5-10: DEP Industrial EE Technical Potential – Cumulative 2041 by End-Use

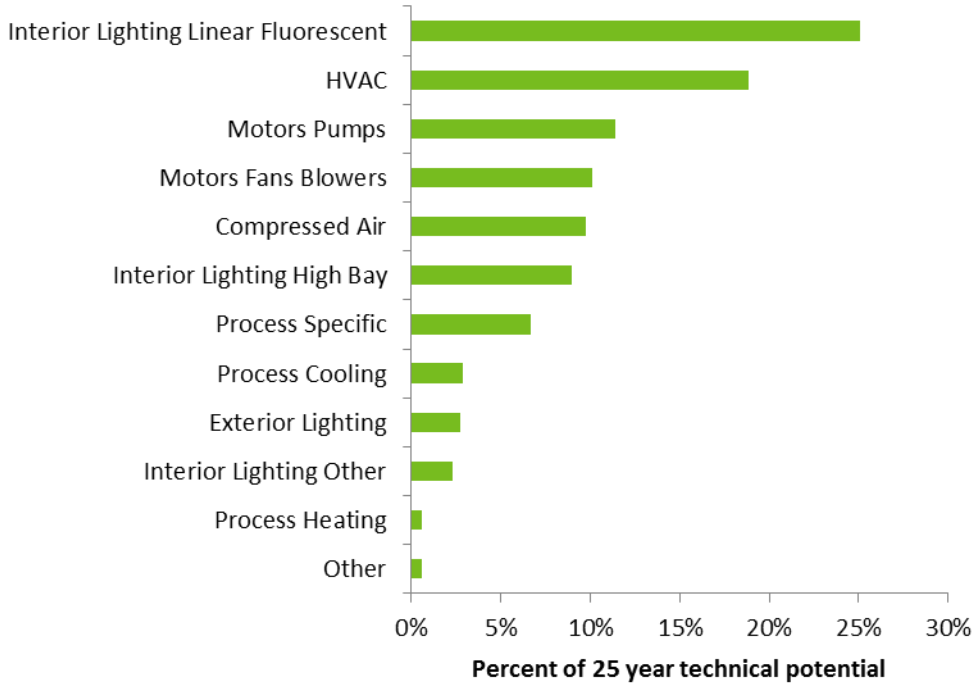
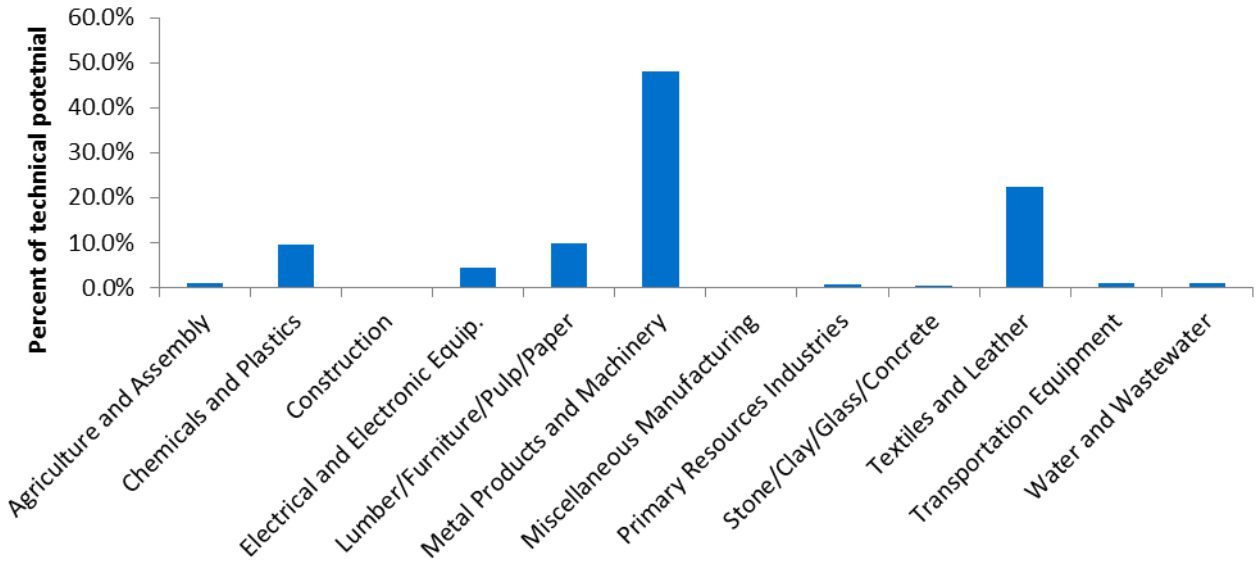


Figure 5-11 provides a summary of DEP energy efficiency technical potential contributions by industrial facility types analyzed in this study.

Figure 5-11: DEP Industrial EE Technical Potential Segment



5.4 DEC Controllable Peak Load, by Customer Type

Technical potential for demand response is defined for each class of customers as follows:

- **Residential & SMB customers** – Technical potential is equal to the aggregate load for all end uses that can participate in Duke Energy's current and planned demand response programs in which the utility uses specialized devices to control loads (i.e. direct load control programs). This includes AC/heating loads for residential and SMB customers, and also water heater and pool pump loads for residential customers. Not all demand reductions are delivered via direct load control of end-uses and some programs explicitly target behavior (i.e., they are not automated). The magnitude of demand reductions from behavioral programs such as time varying pricing, peak time rebates and targeted notifications is linked to cooling and heating loads. While other end-uses may be curtailed, they are not well defined based on empirical studies.
- **Large C&I customers** – Technical potential is equal to the total amount of load for each customer segment. This reflects the behavioral nature of most large C&I programs and the fact that for a large enough payment and small enough number of events, large C&I customers would be willing to reduce their usage to zero.

Table 5-3 summarizes the seasonal demand response technical potential by sector:

Table 5-3: DEC DR Technical Potential by Sector

Sector	Annual Technical Potential	
	Summer (Agg MW)	Winter (Agg MW)
Residential	982	870
SMB	125	68
Large C&I	1,778	1,501
Total	2,885	2,439

5.4.1 Residential and SMB Customers

Residential technical potential is summarized Table 5-4. The potential is broken down by end use and building type. A more detailed breakdown of the AC and heating loads by customer segment is provided in the economic potential section, along with the cost-effectiveness of each customer segment.

Table 5-4: DEC Residential Demand Technical Potential

Rate Classes	Season	End Uses	Single Family Residential		Multi Family Residential		Total
			Avg. kw	Agg. MW	Avg. kw	Agg. MW	Agg. MW
RS	Summer	AC Cooling	2.49	514	2.49	38	**552**
	Winter	Heating	-	-	-	-	**-**
	Summer/Winter	Water Heater	0.16/0.36	25/56	0.16/0.36	1.9/4.2	**27/60**
	Summer	Pool Pump	1.00	23	-	-	**23**
RE	Summer	AC Cooling	2.02	271	2.02	73	**344**
	Winter	Heating	4.41	602	4.45	162	**764**
	Summer/Winter	Water Heater	0.16/0.36	16/36	0.16/0.36	4.4/10.0	**20/46**
	Summer	Pool Pump	1.00	15	-	-	**15**
RT	Summer	AC Cooling	4.41	1.11	-	-	**1.11**
	Winter	Heating	5.14	0.04	-	-	**0.04**
	Summer/Winter	Water Heater	0.16/0.36	0.03/0.09	-	-	**0.03/0.07**
	Summer	Pool Pump	1.00	0.03	-	-	**0.03**

Small Business technical potential is provided in Table 5-5.

Table 5-5: DEC SMB Demand Technical Potential

Segment	AC Cooling		Heating	
	Avg. kw	Agg. MW	Avg. kw	Agg. MW
Assembly	4.12	19.42	24.44	11.04
Colleges and Universities	2.39	1.08	15.42	0.49
Data Centers	6.28	0.40	23.63	0.22
Grocery	4.06	3.49	3.98	0.47
Healthcare	4.38	6.80	27.48	3.61
Hospitals	5.88	0.56	166.88	0.37
Institutional	3.65	8.44	22.40	5.03
Lodging (Hospitality)	2.58	1.09	13.28	1.35
Miscellaneous	0.57	4.19	6.84	4.87
Office	1.38	15.71	8.80	12.10
Restaurants	6.71	13.41	0.00	0.00
Retail	1.75	37.23	6.19	18.28
Schools K-12	2.55	3.21	34.64	3.06
Warehouse	1.92	2.18	18.38	2.16
Agriculture & Forestry	1.28	2.68	0.49	1.03
Chemicals & Plastics	3.19	0.87	2.73	0.75
Construction	0.65	0.12	0.66	0.12
Electrical & Electronic Equipment	2.72	0.27	0.35	0.03
Lumber, Furniture, Pulp and Paper	1.98	0.53	1.15	0.31
Metal Products & Machinery	3.01	1.47	1.54	0.75
Misc. Manufacturing	0.48	0.34	0.31	0.22
Primary Resource Industries	0.47	0.24	0.42	0.22
Stone, Clay, Glass and Concrete	2.49	0.21	2.93	0.25
Textiles & Leather	2.84	0.41	1.56	0.23
Transportation Equipment	1.12	0.10	1.79	0.15
Water and Wastewater	0.64	0.75	0.83	0.98
Total		**125**		**68**

Overall the bulk of the technical potential from these two sectors comes from residential cooling and heating loads, particularly from single family homes.

5.4.2 Large C&I Customers

Technical potential for C&I customers, broken down by customer segments and three buckets of customer sizes is given in Table 5-6. The majority of the technical potential provided by large C&I customers comes from the largest class of customers, with the smallest class having almost no substantial load during system peaks. In DEC's territory, the majority of nonresidential customers

either qualified as SMB customers (<300 kW demand) or were large enough to qualify as large C&I customers with greater than 500 kW of demand. Much of the technical potential for large C&I customers comes from a handful of industries, particularly chemicals/plastics; lumber, furniture, pulps, & paper; metal products/machinery; textiles & leather; and transportation equipment. For several of these industries, only customers in the largest size class provide significant load reduction potential.

Table 5-6: DEC Large C&I Demand Technical Potential

Segment	1 MW and Up		500 kW to 1 MW		300 kW to 500 kW	
	Summer	Winter	Summer	Winter	Summer	Winter
Agriculture & Forestry	-	-	-	-	-	-
Chemicals & Plastics	310.9	277.8	304.4	277.8	-	-
Colleges & Universities	41.3	28.1	36.8	28.1	-	-
Data Centers	-	-	-	-	-	-
Electrical & Electronic Equipment	88.5	60.0	86.9	60.0	-	-
Grocery stores / Convenience chains	-	-	-	-	-	-
Healthcare	22.7	14.6	21.7	14.6	-	-
Hospitals	3.4	2.0	3.2	2.0	-	-
Institutional	1.9	1.1	1.9	1.1	-	-
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	-	-	-	-	-
Lodging (Hospitality)	-	-	0.8	0.7	-	-
Lumber, Furniture, Pulp & Paper	230.7	234.2	0.4	0.2	-	-
Metal Products & Machinery	101.3	81.3	1.1	0.2	2.2	1.2
Misc. Manufacturing	0.8	0.8	1.3	1.8	-	-
Retail	9.2	6.5	9.4	6.5	-	-
Miscellaneous	28.6	20.4	0.3	0.5	0.0	0.0
Primary Resource Industries	24.9	33.2	25.4	33.2	-	-
Schools K-12	0.7	0.2	0.6	0.2	-	-
Stone, Clay, Glass & Concrete	19.6	15.8	21.0	15.8	-	-
Textiles & Leather	151.7	133.8	0.8	0.9	-	-
Transportation Equipment	100.6	63.4	98.7	63.4	-	-
Warehouse	3.1	2.5	3.2	2.5	-	-
Water & Wastewater	10.0	7.3	7.8	7.3	-	-
Total	**1,150**	**983**	**626**	**517**	**2.2**	**1.2**

5.5 DEP Controllable Peak Load, by Customer Type

Technical potential for demand response is defined for each class of customers as follows: Residential and SMB Customers, and Large C&I Customers.

Table 5-7 summarizes the seasonal demand response technical potential by sector:

Table 5-7: DEP DR Technical Potential by Sector

Sector	Annual Technical Potential	
	Summer (Agg MW)	Winter (Agg MW)
Residential	337	349
SMB	131	93
Large C&I	602	441
Total	1,070	882

5.5.1 Residential and SMB Customers

Residential technical potential is summarized in Table 5-8. The potential is broken down by end use and building type. A more detailed breakdown of the AC and heating loads by customer segment is provided in the economic potential section, along with the cost-effectiveness of each customer segment.

Table 5-8: DEP Residential Demand Technical Potential

Rate Classes	Season	End Uses	Single Family Residential		Multi Family Residential		Total
			Avg. kw	Agg. MW	Avg. kw	Agg. MW	Agg. MW
RES	Summer	AC Cooling	2.49	262	2.49	43	**315**
	Winter	Heating	3.87	268	3.91	54	**322**
	Summer/Winter	Water Heater	016/0.21	13/17	0.16/0.21	2.1/2.8	**15/20**
	Summer	Pool Pump	1.00	12	-	-	**12**
TOU	Summer	AC Cooling	3.04	5.3	3.04	0.07	**5.3**
	Winter	Heating	5.73	7.8	5.79	0.11	**7.9**
	Summer/Winter	Water Heater	0.16/0.21	0.21/0.28	0.16/0.21	0.00/0.00	**0.21/0.28**
	Summer	Pool Pump	1.00	0.20	-	-	**0.20**

Small Business technical potential is provided in Table 5-9.

Table 5-9: DEP SMB Demand Technical Potential

Segment	MGS		SGS		SGS-TOU	
	AC Cooling	Heating	AC Cooling	Heating	AC Cooling	Heating
	Agg. MW	Agg. MW	Agg. MW	Agg. MW	Agg. MW	Agg. MW
Assembly	18.37	30.23	5.83	9.59	0.03	-
Colleges and Universities	1.32	-	0.16	-	-	-
Data Centers	-	-	0.04	0.03	-	-
Grocery	0.09	-	0.18	3.21	-	-
Healthcare	6.01	2.52	2.18	0.29	0.05	-
Hospitals	0.77	1.15	0.01	0.30	0.01	-
Institutional	11.11	14.91	3.93	-	0.06	-
Lodging (Hospitality)	0.81	2.03	0.25	0.64	0.08	-
Miscellaneous	0.07	0.06	0.59	1.41	0.00	-
Office	5.93	2.68	6.63	9.70	0.02	-
Restaurants	8.43	-	3.00	-	0.10	-
Retail	21.61	1.39	14.94	7.67	0.24	-
Schools K-12	2.66	0.19	0.72	-	-	-
Warehouse	0.07	-	0.65	0.63	0.00	-
Agriculture & Forestry	4.24	-	2.03	-	0.02	-
Chemicals & Plastics	0.76	-	0.03	-	-	-
Construction	0.17	-	-	-	-	-
Electrical & Electronic Equipment	0.05	0.11	-	-	0.01	-
Lumber, Furniture, Pulp and Paper	-	-	-	-	-	-
Metal Products & Machinery	2.67	-	-	-	-	-
Misc. Manufacturing	0.09	-	0.05	-	-	-
Primary Resource Industries	0.16	0.29	-	2.52	-	-
Stone, Clay, Glass and Concrete	-	-	0.04	0.13	-	-
Textiles & Leather	-	-	-	0.19	-	-
Transportation Equipment	0.13	-	0.02	0.01	0.01	-
Water and Wastewater	2.23	-	1.34	0.79	-	-
Total	**88**	**56**	**43**	**37**	**0.64**	**-**

Overall the bulk of the technical potential from these two sectors comes from residential cooling and heating loads, particularly from single family homes.

5.5.2 Large C&I Customers

Technical potential for C&I customers, broken down by customer segments and three buckets of customer sizes is given in Table 5-10. The technical potential provided by large C&I customers is fairly evenly split between the two larger classes of customers, with the smallest class not providing any significant load reduction potential during system peaks. This customer class is included for the sake of consistency, but does not provide any DR potential. In DEP's territory, almost all nonresidential customers either qualified as SMB customers (<300 kW demand) or were large enough to qualify as large C&I customers with greater than 500 kW of demand. Much of the potential comes from a couple of industries, particularly textiles & leather and metal products/machinery in both of the larger classes of customer size.

Table 5-10: DEP Large C&I Demand Technical Potential

Segment	1 MW and Up		500 kW to 1 MW		300 kW to 500 kW	
	Summer	Winter	Summer	Winter	Summer	Winter
Agriculture & Forestry	-	-	-	-	-	-
Chemicals & Plastics	11.59	11.92	12.53	11.91	-	-
Colleges & Universities	-	-	-	-	-	-
Data Centers	-	-	-	-	-	-
Electrical & Electronic Equipment	15.17	12.13	15.52	13.70	-	-
Grocery stores / Convenience chains	-	-	-	-	-	-
Healthcare	11.32	9.21	12.01	9.39	-	-
Hospitals	2.37	1.21	2.28	1.23	-	-
Institutional	11.51	7.66	10.57	7.93	-	-
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	-	-	-	-	-
Lodging (Hospitality)	-	-	-	-	-	-
Lumber, Furniture, Pulp & Paper	25.54	22.54	38.50	23.88	-	-
Metal Products & Machinery	120.96	56.61	119.20	96.24	-	-
Misc. Manufacturing	-	-	-	-	-	-
Retail	5.13	8.48	14.20	13.51	-	-
Miscellaneous	22.66	22.01	22.69	22.59	-	-
Primary Resource Industries	0.30	1.04	0.22	1.05	-	-
Schools K-12	-	-	-	-	-	-
Stone, Clay, Glass & Concrete	1.47	1.09	2.33	1.58	-	-
Textiles & Leather	61.44	35.48	59.55	46.21	-	-
Transportation Equipment	1.28	1.09	1.18	1.04	-	-
Warehouse	-	-	-	-	-	-
Water & Wastewater	-	-	-	-	-	-
Total	**291**	**190**	**311**	**250**	**-**	**-**

6 Economic Potential

Nexant used the MPS to calculate economic potential by comparing the expected benefits to the expected costs of DSM measures. Nexant assessed all measure permutations using established economic thresholds. The economic potential was the sum of the energy savings associated with all measure permutations passing the economic screening.

6.1 DSM Cost-Effective Screening Criteria

Based on discussions with Duke Energy, the total resource cost (TRC) test was used for the economic screening of energy efficiency measures in the MPS. The TRC is calculated by comparing the total avoided electricity production and the avoided delivery costs from installing a measure, to that measure's incremental cost. The incremental cost is relative to the cost of the measure's appropriate baseline technology. DSM program delivery and administrative costs, which are included in program-level TRC calculations, were not included in the measure-level economic screening conducted in this study.

The TRC test is applied to each energy efficiency measure based on installation of the measure in Year 1 of the study (i.e. avoided cost benefits begin in Year 1 and extend through the useful life of the measure; incremental costs are also incurred in Year 1). By using DSMore outputs for lifetime avoided cost benefits, the screening aligns with Duke Energy's avoided cost forecast and allows for a direct comparison of measure costs with these avoided cost benefits. The screening will include measures with a TRC ratio of 1.0 or higher for determining economic potential.

For DR screening, Nexant also used the TRC perspective, with the assumption that the incremental cost of implementing DR is equivalent to the utility program costs. However, cost-effectiveness screening for DR potential is inherently of limited usefulness. Economic potential only answers the question "Is a customer segment worth pursuing based on the marginal net benefits they provide?". However, because DR capacity is determined by participation levels, which is in turn a function of the incentive level, a full cost-effectiveness screening cannot be performed without considering incentive levels, which is a key variable for the various scenarios of the program potential. As such, cost-effectiveness screening for the economic potential only considers non-incentive costs. In other words, customer segments are screened based on whether the marginal cost-effectiveness of enrolling a customer of that segment provides positive net benefits when only considering marketing, equipment, installation, and program operation costs.

For this analysis, the non-incentive costs for each sector is detailed in Table 6-1. These values are based on the costs assumed for a similar DR potential study conducted for SMUD, and represent reasonable cost estimates in today's dollars with current technology. Another key assumption that is part of the program potential analysis is the degree to which these costs are

expected to decline in future years. However, economic potential screening is conducted using today's technology costs.

Table 6-1: Non-Incentive Costs

	One-Time				Recurring (per year)
	Equipment	Installation	Acquisition Marketing	Other	Maintenance Marketing
Residential ($/customer)	$ 250.00	$ 200.00	$ 2.50	$ 4.50	$ 1.20
SMB ($/customer)	$ 300.00	$ 300.00	$ 20.00	$ 4.50	$ 1.20
Large C&I ($/MW)	$ 150.00		$ 10.00		

The cost of enrolling customers from each customer segment is compared to the marginal benefits provided by enrolling customers in that segment. Because DR programs are called relatively infrequently, very little benefit is derived from avoided energy costs, to the point where they are insignificant. Instead, DR derives its value from avoided generation capacity and avoided transmission and distribution capacity.

Forecasts of these values were provided by Duke, and formed the basis for the benefit calculations. Because these values were given as annual values, while this study aims to evaluate DR capacity for summer and winter separately, the annual avoided capacity values were allocated between summer and winter. To that end, capacity values were allocated between summer and winter seasons based on weighted percentage of top load hours (i.e. hours when load was within 20% of peak load) that occurred in summer and winter of 2014. Based on this analysis, 73.4% of the avoided capacity is associated with the summer season, with the remaining 26.6% allocated to winter.

6.2 DEC Energy Efficiency Economic Potential

This section provides the results of the DEC energy efficiency economic potential for each of the three segments.

6.2.1 Summary

Table 6-2 summarizes the DEC's energy efficiency economic potential by sector and levelized cost associated with the identified potential:

Table 6-2: DEC EE Economic Potential by Sector

Sector	Economic Potential (2017-2041)			
	Energy (GWh)	% of 2041 Base Sales[19]	Demand (MW)	Levelized Cost[20] ($/kWh)
Residential	1,501	16%	582	$0.050
Commercial	1,015	12%	158	$0.028
Industrial	1,036	9%	216	$0.022
Total	3,552	12%	956	$0.036

6.2.2 Sector Details

Figure 6-1 summarizes the DEC residential sector energy efficiency economic potential by end use.

Figure 6-1: DEC Residential EE Economic Potential – Cumulative 2041 by End-Use

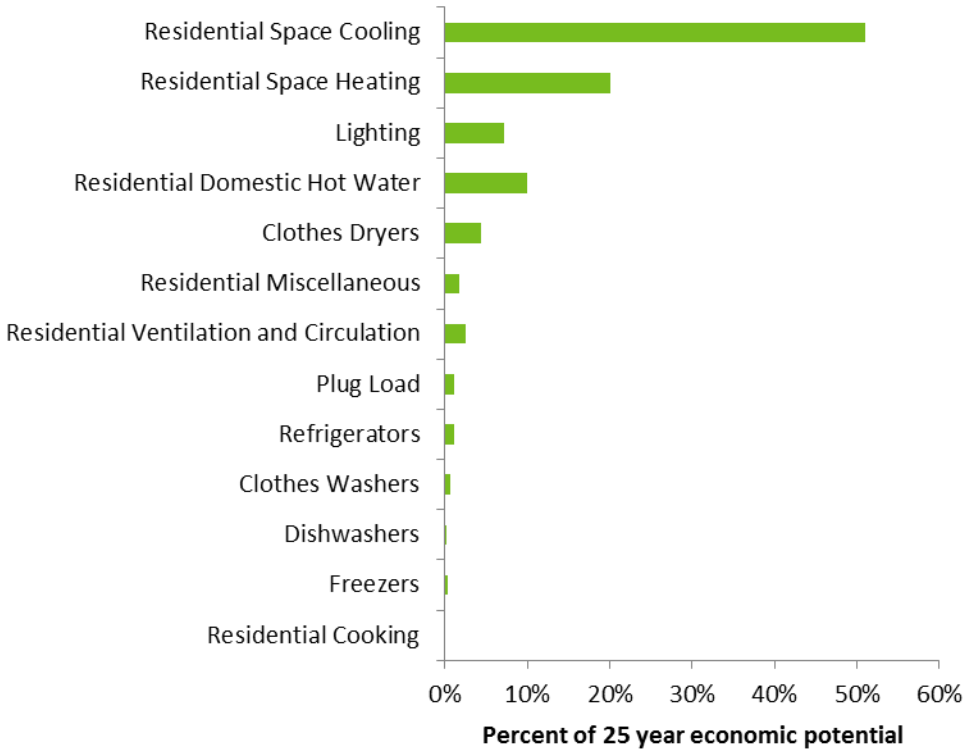


Figure 6-2 summarizes the DEC commercial sector EE economic potential by end use.

[19] Energy savings as a percentage of base sales includes savings impacts that incorporate program opt outs by a portion of eligible commercial and industrial sector customers, as described in Section 3.6.3, compared with total sales forecast for residential, commercial, and industrial sectors

[20] Levelized cost presented from the TRC perspective. Economic potential costs include incremental measure costs.

Figure 6-2: DEC Commercial EE Economic Potential – Cumulative 2041 by End-Use

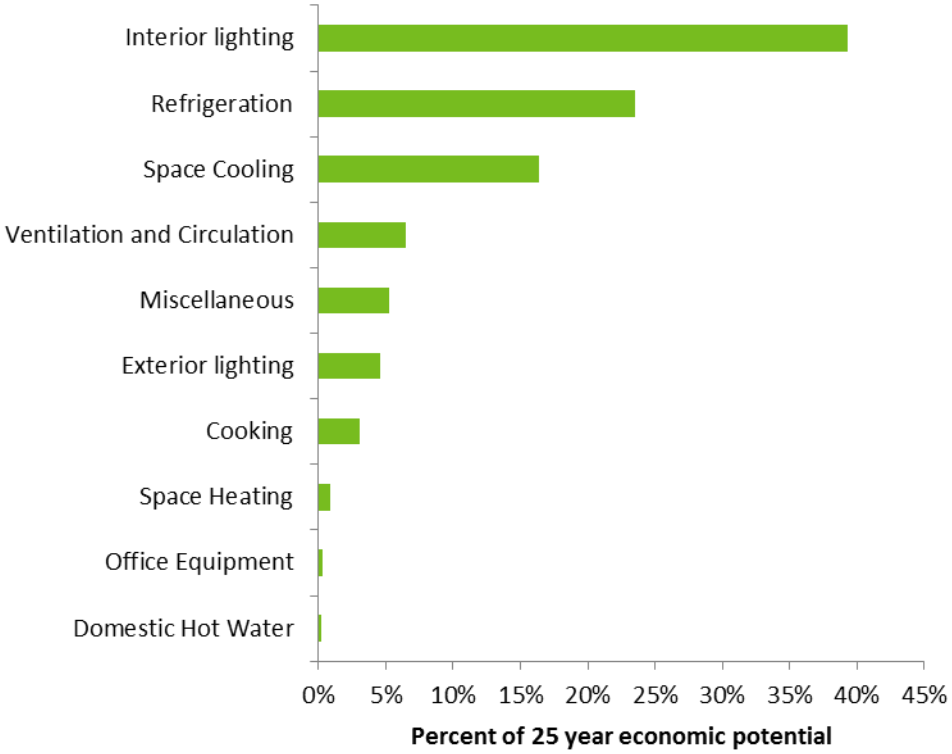


Figure 6-3 provides a summary of DEC energy efficiency economic potential contributions by commercial facility types analyzed in this study.

Figure 6-3: DEC Commercial EE Economic Potential by Segment

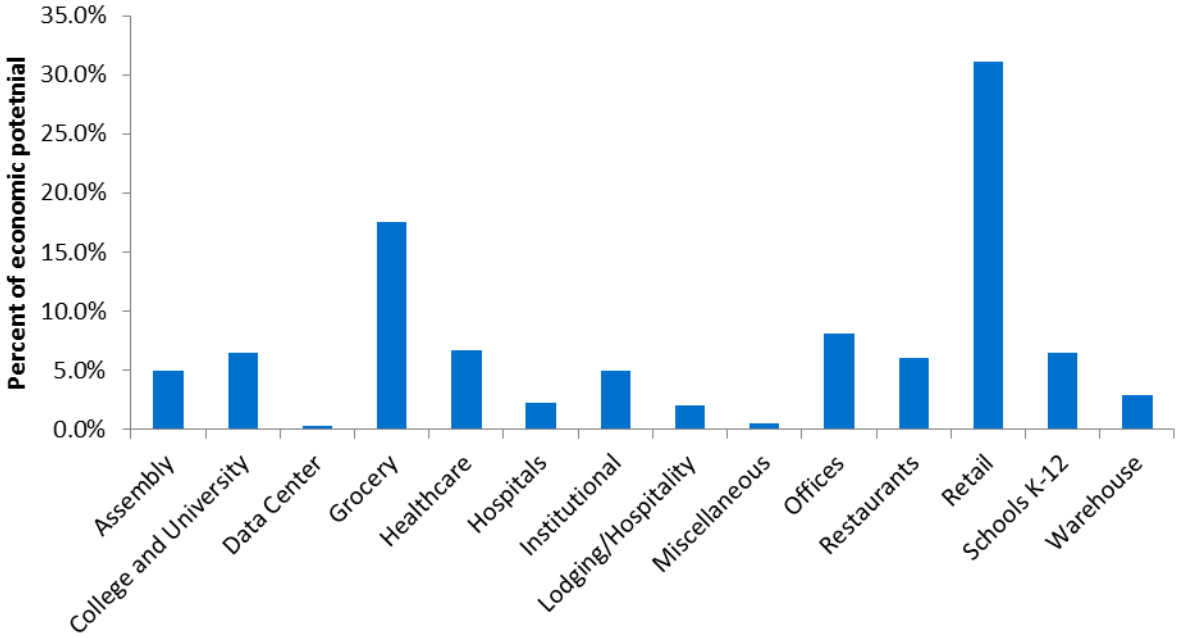


Figure 6-4 summarizes the DEC industrial sector energy efficiency economic potential by end use.

Figure 6-4: DEC Industrial EE Economic Potential – Cumulative 2041 by End-Use

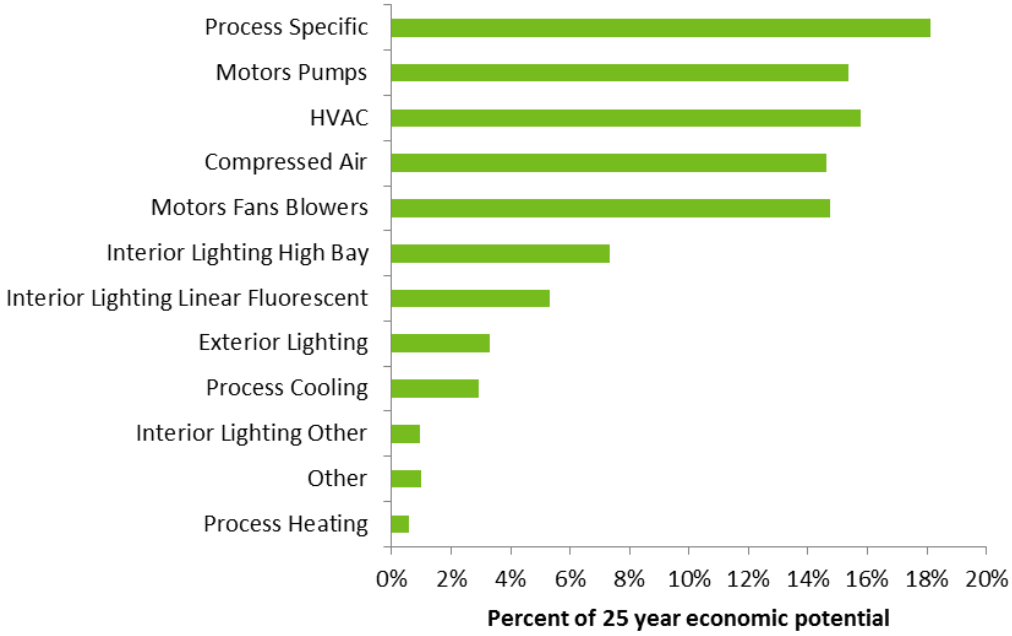
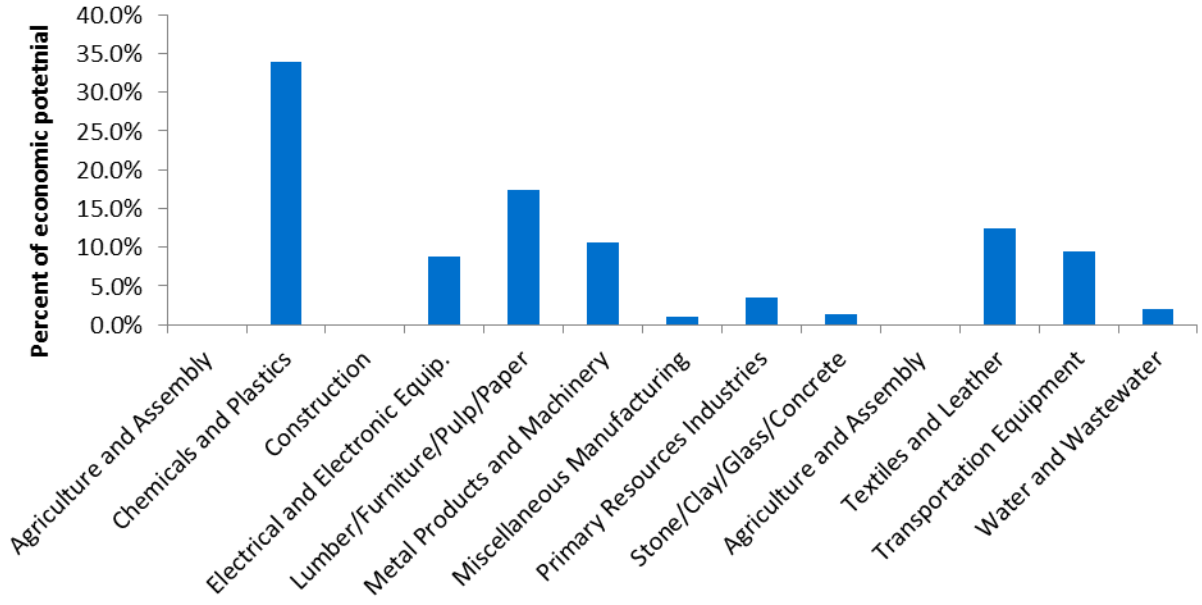


Figure 6-5 provides a summary of DEC energy efficiency technical potential contributions by industrial facility types analyzed in this study.

Figure 6-5: DEC Industrial EE Economic Potential Segment



6.3 DEP Energy Efficiency Economic Potential

This section provides the results of the DEP energy efficiency economic potential for each of the three segments.

6.3.1 Summary

Table 6-3 summarizes the DEP energy efficiency economic potential by sector and levelized cost associated with the identified potential:

Table 6-3: DEP EE Economic Potential by Sector

Sector	Economic Potential (2017-2041)			
	Energy (GWh)	% of 2041 Base Sales[21]	Demand (MW)	Levelized Cost ($/kWh)
Residential	530	18%	162	$0.090
Commercial	246	10%	20	$0.025
Industrial	207	7%	47	$0.022
Total	983	12%	228	$0.058

6.3.2 Sector Details

Figure 6-6 summarizes the DEP residential sector energy efficiency economic potential by end use.

[21] Energy savings as a percentage of base sales includes savings impacts that incorporate program opt outs by a portion of eligible commercial and industrial sector customers, as described in Section 3.6.3, compared with total sales forecast for residential, commercial, and industrial sectors.

Figure 6-6: DEP Residential EE Economic Potential – Cumulative 2041 by End-Use

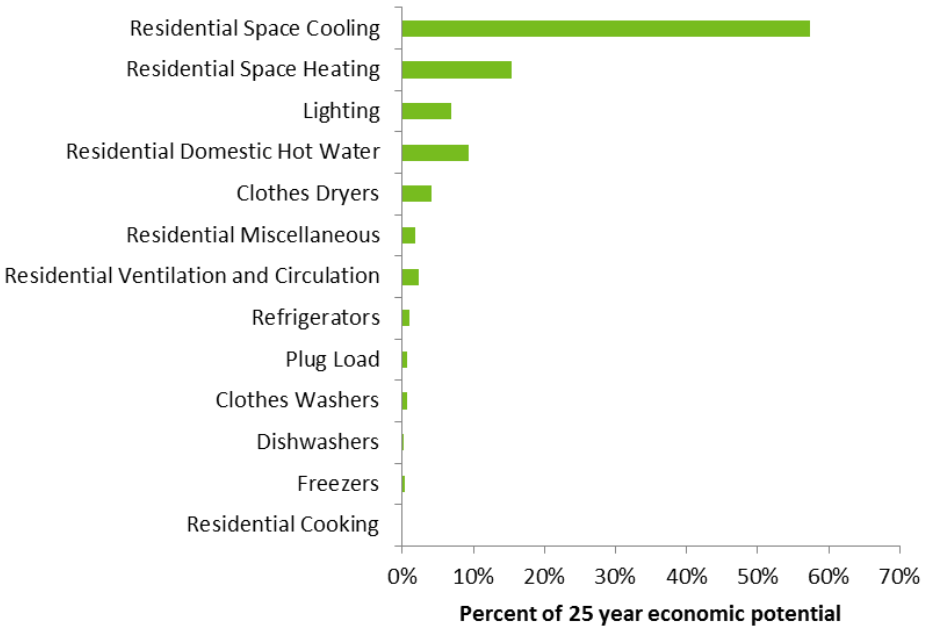


Figure 6-7 summarizes the DEP commercial sector energy efficiency economic potential by end use.

Figure 6-7: DEP Commercial EE Economic Potential – Cumulative 2041 by End-Use

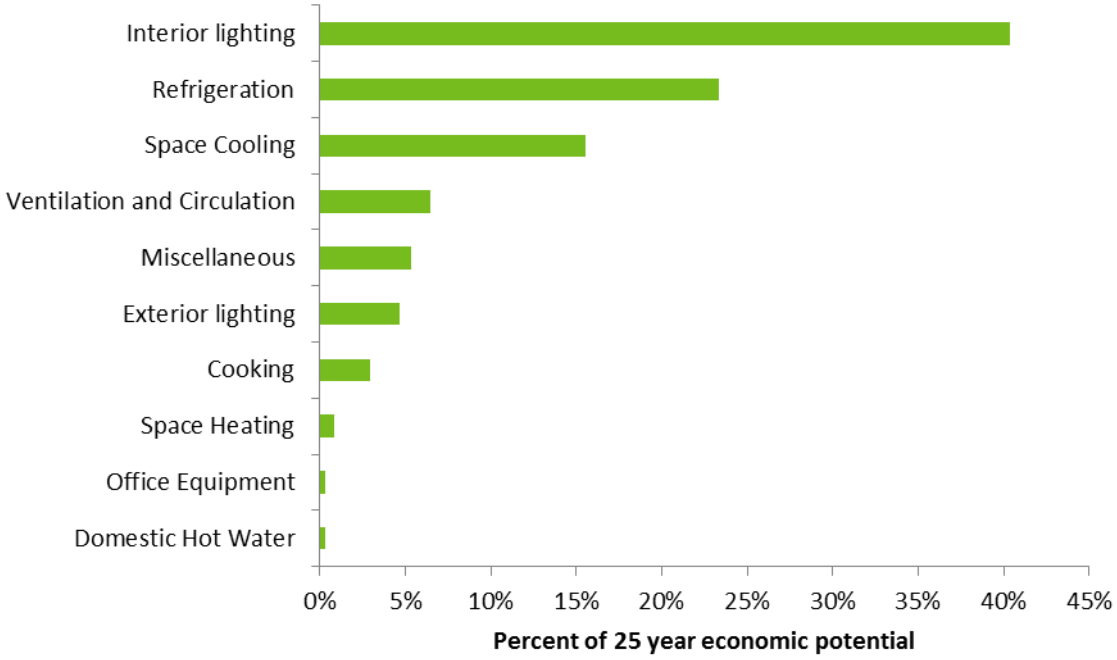


Figure 6-8 provides a summary of energy efficiency economic potential contributions by

commercial facility types analyzed in this study.

Figure 6-8: DEP Commercial EE Economic Potential by Segment

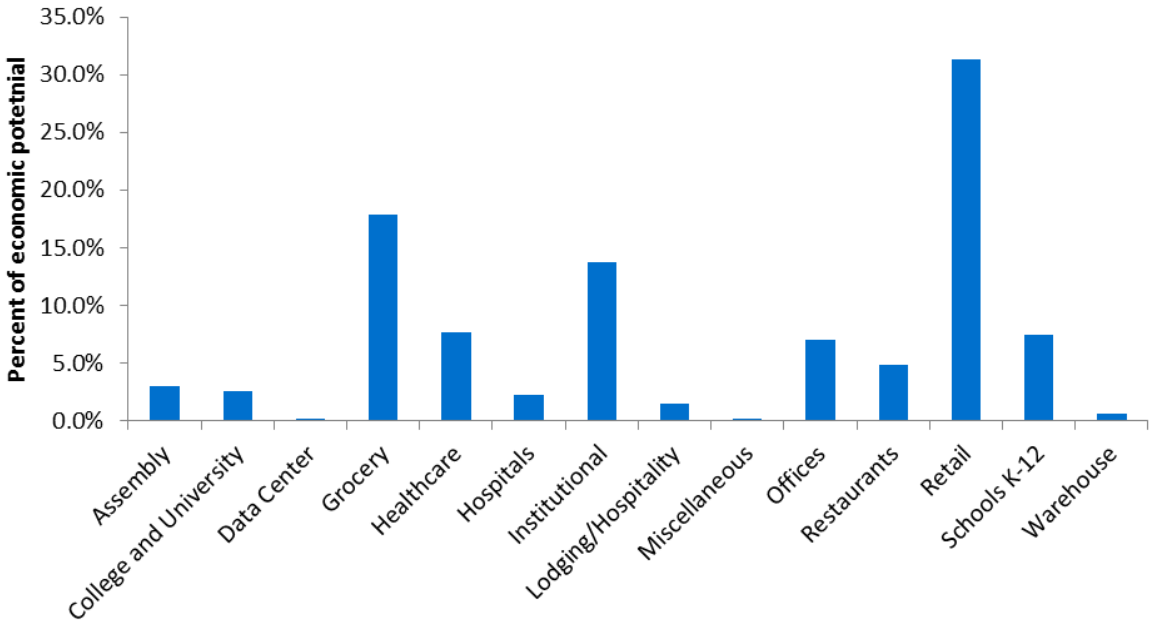


Figure 6-9 summarizes the DEP industrial sector energy efficiency economic potential by end use.

Figure 6-9: DEP Industrial EE Economic Potential – Cumulative 2041 by End-Use

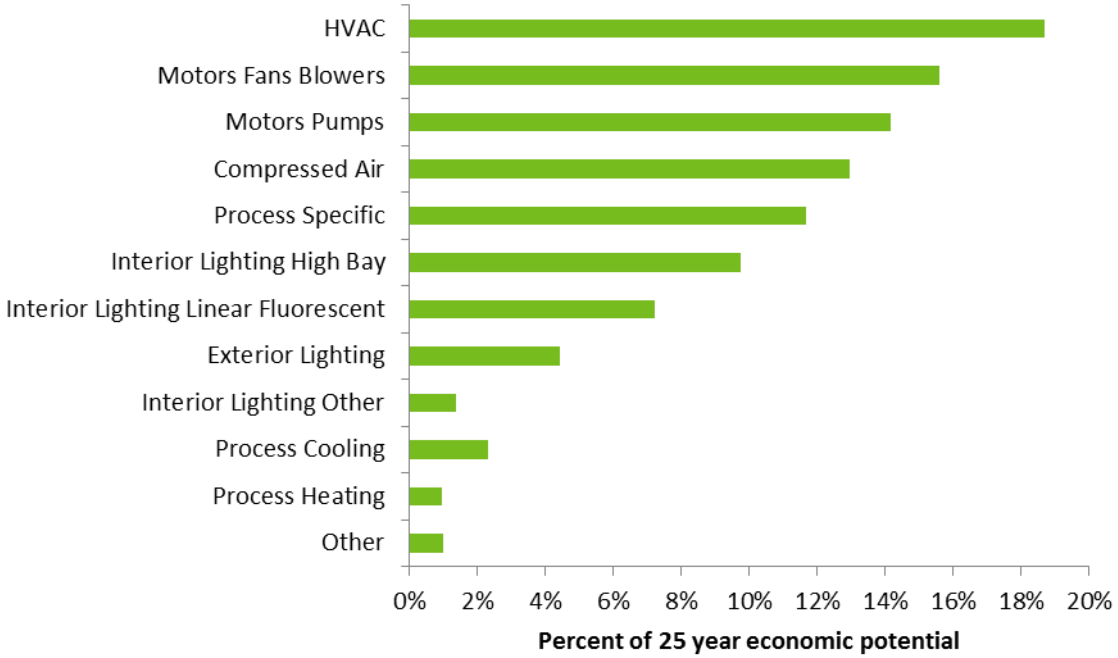
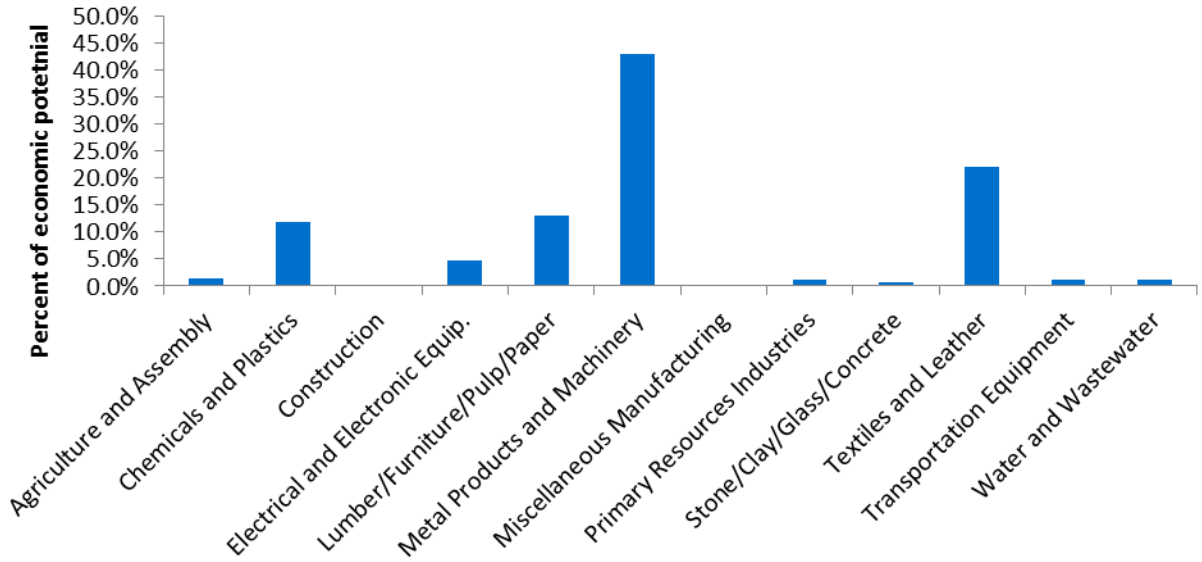


Figure 6-10 provides a summary of DEP energy efficiency technical potential contributions by

industrial facility types analyzed in this study.

Figure 6-10: DEP Industrial EE Economic Potential Segment



6.4 DEC Demand Response Economic Potential

Cost effectiveness screening for economic potential revealed that the vast majority of the technical potential presented in the prior chapter is cost-effective on a marginal basis. Summary results for the economic potential for DEC are presented in Table 6-4. Comparing these numbers to the DEC technical potential by sector in Table 5-3 shows that only a small portion of the residential and SMB technical potential is uneconomic to pursue.

Table 6-4: DEC DR Economic Potential by Sector

Sector	Annual Economic Potential	
	Summer (Agg MW)	Winter (Agg MW)
Residential	976	857
SMB	120	62
Large C&I	1,778	1,501
Total	2,874	2,419

Results for single family residential customer segments are presented in Table 6-5, which summarizes the aggregate capacity each customer segment would be able to provide during summer and winter peaks, along with the benefits associated with that capacity, based on avoided generation and T&D costs. The total cost of enrolling customers in that segment is also presented. The net benefits and net benefits per customer are presented on the right side of the table. Customer segments that do not pass the cost effectiveness screen have negative net benefits in red font. For single family residential customers, there are only two segments that do not pass this screen: the smallest deciles of the RE and RS rate classes.

Table 6-5: DEC Residential Single Family Economic Potential Results

	Single Family			Summer		Winter			
	Usage_ bin	# of accounts	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Customer
RE	1	13,665	$6,654,091	2.1	$1,791,269	13.3	$1,482,750	($3,380,073)	($247)
	2	13,664	$6,653,604	15	$12,874,743	35.8	$4,003,983	$10,225,122	$748
	3	13,667	$6,655,065	19.7	$16,939,544	47.4	$5,300,970	$15,585,450	$1,140
	4	13,662	$6,652,630	22.4	$19,325,032	54.2	$6,064,166	$18,736,568	$1,371
	5	13,665	$6,654,091	25.6	$22,072,218	59.5	$6,662,861	$22,080,988	$1,616
	6	13,666	$6,654,578	28.1	$24,233,797	64.6	$7,225,747	$24,804,966	$1,815
	7	13,660	$6,651,656	31.3	$26,980,983	69.8	$7,809,894	$28,139,221	$2,060
	8	13,661	$6,652,143	35	$30,141,538	75.5	$8,452,232	$31,941,628	$2,338
	9	13,669	$6,656,038	40.4	$34,757,500	83	$9,283,691	$37,385,152	$2,735
	10	13,658	$6,650,682	51.4	$44,221,943	99.1	$11,090,967	$48,662,227	$3,563
RS	1	21,113	$10,280,850	3.9	$3,324,181	-	$ -	($6,956,669)	($329)
	2	21,111	$10,279,876	26.1	$22,468,364	-	$ -	$12,188,488	$577
	3	21,125	$10,286,693	38	$32,690,651	-	$ -	$22,403,958	$1,061
	4	21,095	$10,272,085	45.3	$38,985,927	-	$ -	$28,713,842	$1,361
	5	21,107	$10,277,928	50.6	$43,601,888	-	$ -	$33,323,960	$1,579
	6	21,115	$10,281,824	55.9	$48,131,731	-	$ -	$37,849,907	$1,793
	7	21,112	$10,280,363	60.6	$52,205,144	-	$ -	$41,924,781	$1,986
	8	21,113	$10,280,850	66.1	$56,890,000	-	$ -	$46,609,150	$2,208
	9	21,101	$10,275,007	73.7	$63,478,080	-	$ -	$53,203,073	$2,521
	10	21,110	$10,279,389	94.1	$81,037,678	-	$ -	$70,758,289	$3,352
RT	1	26	$12,661	0.1	$43,059	-	$ -	$30,399	$1,169
	2	26	$12,661	0.1	$60,283	-	$ -	$47,623	$1,832
	3	26	$12,661	0.1	$94,731	-	$ -	$82,070	$3,157
	4	26	$12,661	0.1	$86,119	-	$ -	$73,458	$2,825
	5	25	$12,174	0.1	$60,283	-	$ -	$48,109	$1,924
	6	26	$12,661	0.1	$77,507	-	$ -	$64,846	$2,494
	7	26	$12,661	0.1	$86,119	-	$ -	$73,458	$2,825
	8	26	$12,661	0.2	$129,178	0.0	$1,119	$117,637	$4,524
	9	26	$12,661	0.2	$155,014	-	$ -	$142,353	$5,475
	10	25	$12,174	0.2	$163,625	0.0	$1,119	$152,571	$6,103
Total AC/Heating Economic Potential (only included if economic)				780.3		588.9			
Additional Potential from WH and PP				78.9		92.0			
Total Potential				**859.2**		**680.8**			

Similar tables are presented for multifamily residential, SMB, and large C&I customers. With the exception of several smaller multi-family residential customer segments, all of the multi-family residential customers are economic. Only a handful of SMB industries are uneconomic to pursue. All of the large C&I industries across all size classes are economic to pursue. As noted in the technical potential summary, there is very little qualifying controllable load from large C&I customers in the 300 kW to 500 kW size class.

Table 6-6: DEC Residential Multifamily Economic Potential Results

	Multi - Family			Summer		Winter			
	Usage _bin	# of accounts	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Customer
RE	1	3,671	$1,787,572	-	$ -	-	$ -	($1,787,572)	($487)
	2	3,663	$1,783,676	-	$ -	-	$ -	($1,783,676)	($487)
	3	3,667	$1,785,624	-	$ -	0.1	$8,952	($1,776,671)	($485)
	4	3,668	$1,786,111	4.1	$3,530,866	8.9	$997,079	$2,741,834	$748
	5	3,666	$1,785,137	6.7	$5,778,563	14.7	$1,641,656	$5,635,082	$1,537
	6	3,668	$1,786,111	8.4	$7,242,581	19	$2,127,326	$7,583,796	$2,068
	7	3,668	$1,786,111	9.7	$8,353,512	21.8	$2,433,947	$9,001,349	$2,454
	8	3,667	$1,785,624	11.3	$9,748,635	25.5	$2,853,594	$10,816,604	$2,950
	9	3,665	$1,784,650	13.4	$11,514,068	30	$3,352,693	$13,082,110	$3,569
	10	3,666	$1,785,137	19.1	$16,448,668	41.7	$4,664,227	$19,327,758	$5,272
RS	1	1,563	$761,094	-	$ -	-	$ -	($761,094)	($487)
	2	1,560	$759,633	-	$ -	-	$ -	($759,633)	($487)
	3	1,560	$759,633	1.1	$955,917	-	$ -	$196,285	$126
	4	1,562	$760,607	2.5	$2,109,908	-	$ -	$1,349,301	$864
	5	1,560	$759,633	3.7	$3,169,167	-	$ -	$2,409,535	$1,545
	6	1,560	$759,633	5.0	$4,262,875	-	$ -	$3,503,242	$2,246
	7	1,560	$759,633	5.4	$4,667,632	-	$ -	$3,908,000	$2,505
	8	1,561	$760,120	6.2	$5,296,299	-	$ -	$4,536,179	$2,906
	9	1,561	$760,120	6.7	$5,761,340	-	$ -	$5,001,220	$3,204
	10	1,560	$759,633	7.6	$6,501,960	-	$ -	$5,742,328	$3,681
RT	1	-	$0	-	$ -	-	$ -	$0	-
	2	-	$0	-	$ -	-	$ -	$0	-
	3	-	$0	-	$ -	-	$ -	$0	-
	4	-	$0	-	$ -	-	$ -	$0	-
	5	-	$0	-	$ -	-	$ -	$0	-
	6	-	$0	-	$ -	-	$ -	$0	-
	7	-	$0	-	$ -	-	$ -	$0	-
	8	-	$0	-	$ -	-	$ -	$0	-
	9	-	$0	-	$ -	-	$ -	$0	-
	10	-	$0	-	$ -	-	$ -	$0	-
Total AC/Heating Economic Potential (only included if economic)				110.7		161.5			
Additional Potential from WH and PP				6.3		14.2			
Total Potential				**117.0**		**175.7**			

Table 6-7: DEC SMB Economic Potential Results

SMB			Summer		Winter			
Segment	# of Accounts	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Customer
Assembly	5,639	$3,690,410	19.4	$16,724,248	11.04	$1,235,438	$14,269,276	$2,530
Colleges & Universities	482	$315,442	1.1	$930,082	0.49	$54,834	$669,473	$1,389
Data Centers	130	$85,078	0.4	$344,475	0.22	$24,619	$284,016	$2,185
Grocery	989	$647,245	3.5	$3,005,542	0.47	$52,596	$2,410,892	$2,438
Healthcare	1,920	$1,256,533	6.8	$5,856,070	3.61	$403,979	$5,003,517	$2,606
Hospitals	111	$72,643	0.6	$482,265	0.37	$41,405	$451,026	$4,063
Institutional	3,783	$2,475,762	8.4	$7,268,417	5.03	$562,885	$5,355,540	$1,416
Lodging (Hospitality)	460	$301,044	1.1	$938,694	1.35	$151,073	$788,722	$1,715
Miscellaneous	10,010	$6,550,985	4.2	$3,608,373	4.87	$544,980	($2,397,632)	($240)
Office	12,738	$8,336,309	15.7	$13,529,245	12.1	$1,354,058	$6,546,994	$514
Restaurants	2,170	$1,420,144	13.4	$11,548,515	-	$ -	$10,128,371	$4,667
Retail	27,688	$18,120,247	37.2	$32,061,985	18.28	$2,045,635	$15,987,372	$577
Schools K-12	1,342	$878,264	3.2	$2,764,410	3.06	$342,431	$2,228,577	$1,661
Warehouse	2,269	$1,484,934	2.2	$1,877,387	2.16	$241,716	$634,170	$279
Agriculture & Forestry	2,100	$1,374,333	2.7	$2,307,981	1.03	$115,263	$1,048,911	$499
Chemicals & Plastics	274	$179,318	0.9	$749,233	0.75	$83,929	$653,844	$2,386
Construction	188	$123,035	0.1	$103,342	0.12	$13,429	($6,264)	($33)
Electrical & Electronic Equipment	98	$64,136	0.3	$232,520	0.03	$3,357	$171,742	$1,752
Lumber, Furniture, Pulp & Paper	269	$176,045	0.5	$456,429	0.31	$34,691	$315,074	$1,171
Metal Products & Machinery	487	$318,714	1.5	$1,265,945	0.75	$83,929	$1,031,160	$2,117
Misc. Manufacturing	712	$465,964	0.3	$292,804	0.22	$24,619	($148,541)	($209)
Primary Resource Industries	513	$335,730	0.2	$206,685	0.22	$24,619	($104,426)	($204)
Stone, Clay, Glass & Concrete	86	$56,282	0.21	$180,849	0.25	$27,976	$152,543	$1,774
Textiles & Leather	144	$94,240	0.41	$353,087	0.23	$25,738	$284,585	$1,976
Transportation Equipment	86	$56,282	0.1	$86,119	0.15	$16,786	$46,622	$542
Water & Wastewater	1,171	$766,354	0.8	$645,890	0.98	$109,668	($10,796)	($9)
Total			**119.6**		**61.7**			

Table 6-8: DEC Large C&I (1 MW and Up) Economic Potential Results

Large C&I (1 MW and Up)			Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per MW
Agriculture & Forestry	-	$ -	-	$ -	-	$ -	$ -	
Chemicals & Plastics	310.9	$49,744,000	310.9	$267,742,978	277.8	$31,087,384	$249,086,362	$801,178
Colleges & Universities	41.3	$6,608,000	41.3	$35,567,015	28.1	$3,144,548	$32,103,563	$777,326
Data Centers	-	$ -	-	$ -	-	$ -	$ -	
Electrical & Electronic Equipment	88.5	$14,160,000	88.5	$76,215,032	60	$6,714,338	$68,769,370	$777,055
Grocery stores / Convenience chains	-	$ -	-	$ -	-	$ -	$ -	
Healthcare	22.7	$3,632,000	22.7	$19,548,941	14.6	$1,633,822	$17,550,763	$773,161
Hospitals	3.4	$544,000	3.4	$2,928,035	2	$223,811	$2,607,846	$767,014
Institutional	1.9	$304,000	1.9	$1,636,255	1.1	$123,096	$1,455,351	$765,974
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	$ -	-	$ -	-	$ -	$ -	
Lodging (Hospitality)	-	$ -	-	$ -	-	$ -	$ -	
Lumber, Furniture, Pulp & Paper	234.2	$37,472,000	230.7	$198,675,796	234.2	$26,208,299	$187,412,095	$800,222
Metal Products & Machinery	101.3	$16,208,000	101.3	$87,238,224	81.3	$9,097,928	$80,128,151	$790,999
Misc. Manufacturing	0.8	$128,000	0.8	$688,949	0.8	$89,525	$650,474	$813,092
Retail	9.2	$1,472,000	9.2	$7,922,919	6.5	$727,387	$7,178,305	$780,251
Miscellaneous	28.6	$4,576,000	28.6	$24,629,943	20.4	$2,282,875	$22,336,818	$781,008
Primary Resource Industries	33.2	$5,312,000	24.9	$21,443,551	33.2	$3,715,267	$19,846,818	$597,796
Schools K-12	0.7	$112,000	0.7	$602,831	0.2	$22,381	$513,212	$733,160
Stone, Clay, Glass & Concrete	19.6	$3,136,000	19.6	$16,879,261	15.8	$1,768,109	$15,511,370	$791,396
Textiles & Leather	151.7	$24,272,000	151.7	$130,642,039	133.8	$14,972,973	$121,343,012	$799,888
Transportation Equipment	100.6	$16,096,000	100.6	$86,635,393	63.4	$7,094,817	$77,634,210	$771,712
Warehouse	3.1	$496,000	3.1	$2,669,679	2.5	$279,764	$2,453,443	$791,433
Water & Wastewater	10.0	$1,600,000	10	$8,611,868	7.3	$816,911	$7,828,779	$782,878
Total			**1,150**		**983**			

Table 6-9: DEC Large C&I (500 kW to 1 MW) Economic Potential Results

Large C&I (500 kW to 1 MW)			Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per MW
Agriculture & Forestry	-	$ -	-	$ -	-	$ -	$ -	
Chemicals & Plastics	304.4	$48,704,000	304.4	$262,145,264	277.8	$31,087,384	$244,528,648	$803,314
Colleges & Universities	36.8	$5,888,000	36.8	$31,691,674	28.1	$3,144,548	$28,948,223	$786,636
Data Centers	-	$ -	-	$ -	-	$ -	$ -	
Electrical & Electronic Equipment	86.9	$13,904,000	86.9	$74,837,133	60	$6,714,338	$67,647,471	$778,452
Grocery stores / Convenience chains	-	$ -	-	$ -	-	$ -	$ -	
Healthcare	21.7	$3,472,000	21.7	$18,687,754	14.6	$1,633,822	$16,849,576	$776,478
Hospitals	3.2	$512,000	3.2	$2,755,798	2	$223,811	$2,467,609	$771,128
Institutional	1.9	$304,000	1.9	$1,636,255	1.1	$123,096	$1,455,351	$765,974
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	$ -	-	$ -	-	$ -	$ -	
Lodging (Hospitality)	0.8	$128,000	0.8	$688,949	0.7	$78,334	$639,283	$799,104
Lumber, Furniture, Pulp & Paper	0.4	$64,000	0.4	$344,475	0.2	$22,381	$302,856	$757,140
Metal Products & Machinery	1.1	$176,000	1.1	$947,305	0.2	$22,381	$793,687	$721,533
Misc. Manufacturing	1.8	$288,000	1.3	$1,119,543	1.8	$201,430	$1,032,973	$573,874
Retail	9.4	$1,504,000	9.4	$8,095,156	6.5	$727,387	$7,318,543	$778,568
Miscellaneous	0.5	$80,000	0.3	$258,356	0.5	$55,953	$234,309	$468,618
Primary Resource Industries	33.2	$5,312,000	25.4	$21,874,145	33.2	$3,715,267	$20,277,412	$610,765
Schools K-12	0.6	$96,000	0.6	$516,712	0.2	$22,381	$443,093	$738,489
Stone, Clay, Glass & Concrete	21.0	$3,360,000	21	$18,084,923	15.8	$1,768,109	$16,493,032	$785,382
Textiles & Leather	0.9	$144,000	0.8	$688,949	0.9	$100,715	$645,665	$717,405
Transportation Equipment	98.7	$15,792,000	98.7	$84,999,138	63.4	$7,094,817	$76,301,955	$773,069
Warehouse	3.2	$512,000	3.2	$2,755,798	2.5	$279,764	$2,523,562	$788,613
Water & Wastewater	7.8	$1,248,000	7.8	$6,717,257	7.3	$816,911	$6,286,168	$805,919
Total			**626**		**517**			

Table 6-10: DEC Large C&I (300 kW to 500 kW) Economic Potential Results

Large C&I (300 kW to 500 Kw)			Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per MW
Agriculture & Forestry	-	$ -	-	$ -	-	$ -	$ -	$ -
Chemicals & Plastics	-	$ -	-	$ -	-	$ -	$ -	$ -
Colleges & Universities	-	$ -	-	$ -	-	$ -	$ -	$ -
Data Centers	-	$ -	-	$ -	-	$ -	$ -	$ -
Electrical & Electronic Equipment	-	$ -	-	$ -	-	$ -	$ -	$ -
Grocery stores / Convenience chains	-	$ -	-	$ -	-	$ -	$ -	$ -
Healthcare	-	$ -	-	$ -	-	$ -	$ -	$ -
Hospitals	-	$ -	-	$ -	-	$ -	$ -	$ -
Institutional	-	$ -	-	$ -	-	$ -	$ -	$ -
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	$ -	-	$ -	-	$ -	$ -	$ -
Lodging (Hospitality)	-	$ -	-	$ -	-	$ -	$ -	$ -
Lumber, Furniture, Pulp & Paper	-	$ -	-	$ -	-	$ -	$ -	$ -
Metal Products & Machinery	2.2	$352,000	2.2	$1,894,611	1.2	$134,287	$1,676,898	$762,226
Misc. Manufacturing	-	$ -	-	$ -	-	$ -	$ -	$ -
Retail	-	$ -	-	$ -	-	$ -	$ -	$ -
Miscellaneous	-	$ -	-	$ -	-	$ -	$ -	$ -
Primary Resource Industries	-	$ -	-	$ -	-	$ -	$ -	$ -
Schools K-12	-	$ -	-	$ -	-	$ -	$ -	$ -
Stone, Clay, Glass & Concrete	-	$ -	-	$ -	-	$ -	$ -	$ -
Textiles & Leather	-	$ -	-	$ -	-	$ -	$ -	$ -
Transportation Equipment	-	$ -	-	$ -	-	$ -	$ -	$ -
Warehouse	-	$ -	-	$ -	-	$ -	$ -	$ -
Water & Wastewater	-	$ -	-	$ -	-	$ -	$ -	$ -
Total			**2.2**		**1.2**			

6.5 DEP Demand Response Economic Potential

Cost effectiveness screening for economic potential revealed that practically all of the technical potential presented in the prior chapter is cost-effective on a marginal basis. Summary results for the economic potential for DEP are presented in Table 6-11. Comparing these numbers to the DEP technical potential by sector in Table 5-7 shows that practically all of the technical potential is economic. While some of the segments presented in this section are uneconomic to pursue, they do not have significant aggregate load that coincides with system peaks.

Table 6-11: DEP DR Economic Potential by Sector

Sector	Annual Economic Potential	
	Summer (Agg MW)	Winter (Agg MW)
Residential	337	349
SMB	131	92
Large C&I	602	441
Total	1,070	882

Results for single family residential customer segments are presented in Table 6-12. The customers are segmented by rate class and consumption decile. This table summarizes the aggregate capacity each customer segment would be able to provide during summer and winter peaks, along with the benefits associated with that capacity, based on avoided generation and T&D costs. The total cost of enrolling customers in that segment is also presented. The net benefits and net benefits per customer are presented on the right side of the table. Customer segments that do not pass the cost effectiveness screen have negative net benefits in red font. For single family residential customers, only the smallest decile of customers in the RES rate class are uneconomic, but these customers on aggregate do not have a significant amount of load that coincides with system peaks.

Table 6-12: DEP Residential Single Family Economic Potential Results

	Single Family			Summer		Winter			
	Usage_ bin	# of accounts	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Customer
RES	1	10,759	$5,248,196	-	$ -	-	$ -	($5,248,196)	($488)
	2	10,755	$5,246,245	8.4	$5,378,950	6	$1,470,919	$1,603,623	$149
	3	10,757	$5,247,221	20.7	$13,171,595	16.1	$3,935,881	$11,860,255	$1,103
	4	10,757	$5,247,221	24.2	$15,448,518	23	$5,615,719	$15,817,016	$1,470
	5	10,757	$5,247,221	26.6	$16,947,842	27	$6,595,859	$18,296,480	$1,701
	6	10,754	$5,245,757	28.8	$18,328,649	30.6	$7,469,736	$20,552,628	$1,911
	7	10,759	$5,248,196	31	$19,754,655	34.6	$8,456,499	$22,962,957	$2,134
	8	10,754	$5,245,757	34.1	$21,713,475	38.5	$9,396,886	$25,864,603	$2,405
	9	10,757	$5,247,221	39.3	$25,046,056	42.5	$10,391,340	$30,190,175	$2,806
	10	10,756	$5,246,733	49.1	$31,290,830	49.3	$12,033,137	$38,077,234	$3,540
R-TOU	1	178	$86,825	0.1	$83,831	0.2	$44,434	$41,440	$233
	2	178	$86,825	0.4	$233,676	0.6	$134,508	$281,359	$1,581
	3	178	$86,825	0.4	$274,066	0.7	$173,479	$360,720	$2,027
	4	178	$86,825	0.4	$285,529	0.8	$194,195	$392,899	$2,207
	5	178	$86,825	0.5	$341,609	0.8	$189,677	$444,460	$2,497
	6	177	$86,337	0.6	$354,553	0.8	$198,064	$466,280	$2,634
	7	178	$86,825	0.6	$370,310	0.8	$206,689	$490,174	$2,754
	8	178	$86,825	0.7	$415,753	0.7	$181,333	$510,260	$2,867
	9	178	$86,825	0.7	$462,074	1.1	$277,157	$652,405	$3,665
	10	177	$86,337	0.9	$550,934	1.2	$293,012	$757,608	$4,280
Total AC/Heating Economic Potential (only included if economic)				267.4		275.4			
Additional Potential from WH and PP				24.8		17.0			
Total Potential				**292.2**		**292.4**			

Similar tables are presented for multifamily residential, SMB, and large C&I customers. With the exception of several smaller multi-family residential customer segments and a handful of SMB industries, nearly all of these customers are economic. As mentioned previously, there is no significant peak load provided by the smallest size class of large C&I customers. This table is presented for the sake of consistency.

Table 6-13: DEP Residential Multifamily Economic Potential Results

	Single Family			Summer		Winter			
	Usage_ bin	# of accounts	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Customer
RES	1	1,765	$860,741	-	$ -	-	$ -	($860,741)	($488)
	2	1,764	$860,253	-	$ -	-	$ -	($860,253)	($488)
	3	1,764	$860,253	-	$ -	0.0	$3,754	($856,499)	($486)
	4	1,766	$861,229	2.8	$1,758,237	2.4	$595,551	$1,492,558	$845
	5	1,764	$860,253	3.9	$2,466,804	4.2	$1,034,120	$2,640,671	$1,497
	6	1,765	$860,741	5.1	$3,271,818	5.7	$1,393,425	$3,804,502	$2,156
	7	1,763	$859,765	5.5	$3,503,315	6.4	$1,570,352	$4,213,901	$2,391
	8	1,764	$860,253	6.2	$3,925,159	7.9	$1,925,715	$4,990,621	$2,830
	9	1,764	$860,253	7.5	$4,763,692	9.3	$2,275,702	$6,179,142	$3,504
	10	1,764	$860,253	12.1	$7,708,846	17.9	$4,367,213	$11,215,807	$6,360
R-TOU	1	3	$1,463	0.0	$7,095	0.0	$3,697	$9,328	$3,109
	2	2	$976	-	$ -	0.1	$18,233	$17,258	$8,629
	3	2	$976	-	$ -	-	$ -	($976)	($488)
	4	3	$1,463	0.0	$3,269	0.0	$720	$2,525	$842
	5	2	$976	0.0	$8,533	0.0	$131	$7,688	$3,844
	6	2	$976	0.0	$5,689	0.0	$354	$5,068	$2,534
	7	3	$1,463	0.0	$1,217	0.0	$1,408	$1,162	$387
	8	2	$976	0.0	$6,160	0.0	$649	$5,833	$2,917
	9	2	$976	0.0	$3,809	0.0	$896	$3,730	$1,865
	10	2	$976	0.0	$7,852	0.0	$508	$7,385	$3,692
Total AC/Heating Economic Potential (only included if economic)				43.0		54.0			
Additional Potential from WH and PP				2.1		2.8			
Total Potential				**45.2**		**56.8**			

Table 6-14: DEP SMB Economic Potential Results

SMB			Summer		Winter			
Segment	# of Accounts	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Customer
Assembly	2,313	$1,515,668	24.2	$15,446,270	39.82	$9,725,522	$23,656,124	$10,227
Colleges & Universities	133	$87,153	1.5	$943,478	-	$ -	$856,326	$6,439
Data Centers	17	$11,140	0.0	$25,499	0.03	$7,327	$21,687	$1,276
Grocery	728	$477,046	0.3	$172,121	3.21	$784,001	$479,077	$658
Healthcare	774	$507,189	8.2	$5,252,879	2.81	$686,306	$5,431,997	$7,018
Hospitals	72	$47,180	0.8	$503,613	1.45	$354,144	$810,577	$11,258
Institutional	4,856	$3,182,051	15.1	$9,626,029	14.91	$3,641,575	$10,085,553	$2,077
Lodging (Hospitality)	283	$185,445	1.1	$726,733	2.67	$652,113	$1,193,402	$4,217
Miscellaneous	790	$517,673	0.7	$420,740	1.47	$359,029	$262,096	$332
Office	3,379	$2,214,199	12.6	$8,019,566	12.38	$3,023,656	$8,829,022	$2,613
Restaurants	967	$633,658	11.5	$7,350,206	-	$ -	$6,716,548	$6,946
Retail	10,833	$7,098,673	36.8	$23,453,086	9.06	$2,212,788	$18,567,201	$1,714
Schools K-12	889	$582,546	3.4	$2,154,700	0.19	$46,405	$1,618,560	$1,821
Warehouse	738	$483,598	0.7	$458,989	0.63	$153,869	$129,260	$175
Agriculture & Forestry	800	$524,226	6.3	$4,009,783	-	$ -	$3,485,557	$4,357
Chemicals & Plastics	70	$45,870	0.8	$503,613	-	$ -	$457,744	$6,539
Construction	2	$1,311	0.2	$108,373	-	$ -	$107,062	$53,531
Electrical & Electronic Equipment	19	$12,450	0.1	$38,249	0.11	$26,866	$52,665	$2,772
Lumber, Furniture, Pulp & Paper	125	$81,910	-	$ -	-	$ -	($81,910)	($655)
Metal Products & Machinery	158	$103,535	2.7	$1,702,086	-	$ -	$1,598,551	$10,117
Misc. Manufacturing	341	$223,451	0.1	$89,248	-	$ -	($134,203)	($394)
Primary Resource Industries	102	$66,839	0.2	$101,998	2.81	$686,306	$721,465	$7,073
Stone, Clay, Glass & Concrete	42	$27,522	0.04	$25,499	0.13	$31,751	$29,728	$708
Textiles & Leather	145	$95,016	-	$ -	0.19	$46,405	($48,611)	($335)
Transportation Equipment	19	$12,450	0.16	$101,998	0.01	$2,442	$91,990	$4,842
Water & Wastewater	801	$524,881	3.6	$2,275,823	0.79	$192,947	$1,943,889	$2,427
Total			**130.9**		**92.5**			

Table 6-15: DEP Large C&I (1 MW and Up) Economic Potential Results

Large C&I (1 MW and Up)			Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per MW
Agriculture & Forestry	-	$ -	-	$ -	-	$ -	$ -	
Chemicals & Plastics	11.9	$1,904,000	11.6	$7,394,830	11.9	$2,906,422	$8,397,252	$705,651
Colleges & Universities	-	$ -	-	$ -	-	$ -	$ -	
Data Centers	-	$ -	-	$ -	-	$ -	$ -	
Electrical & Electronic Equipment	15.2	$2,432,000	15.2	$9,689,777	12.1	$2,955,269	$10,213,046	$671,911
Grocery stores / Convenience chains	-	$ -	-	$ -	-	$ -	$ -	
Healthcare	11.3	$1,808,000	11.3	$7,203,584	9.2	$2,246,982	$7,642,566	$676,333
Hospitals	2.4	$384,000	2.4	$1,529,965	1.2	$293,085	$1,439,049	$599,604
Institutional	11.5	$1,840,000	11.5	$7,331,081	7.7	$1,880,626	$7,371,707	$641,018
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	$ -	-	$ -	-	$ -	$ -	
Lodging (Hospitality)	-	$ -	-	$ -	-	$ -	$ -	
Lumber, Furniture, Pulp & Paper	25.5	$4,080,000	25.5	$16,255,876	22.5	$5,495,335	$17,671,211	$692,989
Metal Products & Machinery	121.0	$19,360,000	121	$77,135,726	56.6	$13,823,821	$71,599,547	$591,732
Misc. Manufacturing	-	$ -	-	$ -	-	$ -	$ -	
Retail	8.5	$1,360,000	5.1	$3,251,175	8.5	$2,076,016	$3,967,191	$466,728
Miscellaneous	22.7	$3,632,000	22.7	$14,470,917	22	$5,373,217	$16,212,134	$714,191
Primary Resource Industries	1.0	$160,000	0.3	$191,246	1	$244,237	$275,483	$275,483
Schools K-12	-	$ -	-	$ -	-	$ -	$ -	
Stone, Clay, Glass & Concrete	1.5	$240,000	1.5	$956,228	1.1	$268,661	$984,889	$656,593
Textiles & Leather	61.4	$9,824,000	61.4	$39,141,600	35.5	$8,670,418	$37,988,017	$618,697
Transportation Equipment	1.3	$208,000	1.3	$828,731	1.1	$268,661	$889,392	$684,148
Warehouse	-	$ -	-	$ -	-	$ -	$ -	
Water & Wastewater	-	$ -	-	$ -	-	$ -	$ -	
Total			**291**		**190**			

Table 6-16: DEP Large C&I (500 kW to 1 MW) Economic Potential Results

Large C&I (500 kW to 1 MW)			Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per MW
Agriculture & Forestry	-	$ -	-	$ -	-	$ -	$ -	
Chemicals & Plastics	12.5	$2,000,000	12.5	$7,968,567	11.9	$2,906,422	$8,874,988	$709,999
Colleges & Universities	-	$ -	-	$ -	-	$ -	$ -	
Data Centers	-	$ -	-	$ -	-	$ -	$ -	
Electrical & Electronic Equipment	15.5	$2,480,000	15.5	$9,881,023	13.7	$3,346,049	$10,747,071	$693,359
Grocery stores / Convenience chains	-	$ -	-	$ -	-	$ -	$ -	
Healthcare	12.0	$1,920,000	12	$7,649,824	9.4	$2,295,829	$8,025,653	$668,804
Hospitals	2.3	$368,000	2.3	$1,466,216	1.2	$293,085	$1,391,301	$604,913
Institutional	10.6	$1,696,000	10.6	$6,757,345	7.9	$1,929,473	$6,990,818	$659,511
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	$ -	-	$ -	-	$ -	$ -	
Lodging (Hospitality)	-	$ -	-	$ -	-	$ -	$ -	
Lumber, Furniture, Pulp & Paper	38.5	$6,160,000	38.5	$24,543,185	23.9	$5,837,267	$24,220,453	$629,103
Metal Products & Machinery	119.2	$19,072,000	119.2	$75,988,252	96.2	$23,495,611	$80,411,863	$674,596
Misc. Manufacturing	-	$ -	-	$ -	-	$ -	$ -	
Retail	14.2	$2,272,000	14.2	$9,052,292	13.5	$3,297,201	$10,077,493	$709,683
Miscellaneous	22.7	$3,632,000	22.7	$14,470,917	22.6	$5,519,759	$16,358,676	$720,647
Primary Resource Industries	1.0	$160,000	0.2	$127,497	1	$244,237	$211,734	$211,734
Schools K-12	-	$ -	-	$ -	-	$ -	$ -	
Stone, Clay, Glass & Concrete	2.3	$368,000	2.3	$1,466,216	1.6	$390,779	$1,488,996	$647,389
Textiles & Leather	59.5	$9,520,000	59.5	$37,930,378	46.2	$11,283,755	$39,694,133	$667,128
Transportation Equipment	1.2	$192,000	1.2	$764,982	1	$244,237	$817,220	$681,016
Warehouse	-	$ -	-	$ -	-	$ -	$ -	
Water & Wastewater	-	$ -	-	$ -	-	$ -	$ -	
Total			**310.7**		**250.1**			

Table 6-17: DEP Large C&I (300 kW to 500 kW) Economic Potential Results

Large C&I (300 kW to 500 Kw)			Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per MW
Agriculture & Forestry	-	$ -	-	$ -	-	$ -	$ -	$ -
Chemicals & Plastics	-	$ -	-	$ -	-	$ -	$ -	$ -
Colleges & Universities	-	$ -	-	$ -	-	$ -	$ -	$ -
Data Centers	-	$ -	-	$ -	-	$ -	$ -	$ -
Electrical & Electronic Equipment	-	$ -	-	$ -	-	$ -	$ -	$ -
Grocery stores / Convenience chains	-	$ -	-	$ -	-	$ -	$ -	$ -
Healthcare	-	$ -	-	$ -	-	$ -	$ -	$ -
Hospitals	-	$ -	-	$ -	-	$ -	$ -	$ -
Institutional	-	$ -	-	$ -	-	$ -	$ -	$ -
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	$ -	-	$ -	-	$ -	$ -	$ -
Lodging (Hospitality)	-	$ -	-	$ -	-	$ -	$ -	$ -
Lumber, Furniture, Pulp & Paper	-	$ -	-	$ -	-	$ -	$ -	$ -
Metal Products & Machinery	-	$ -	-	$ -	-	$ -	$ -	$ -
Misc. Manufacturing	-	$ -	-	$ -	-	$ -	$ -	$ -
Retail	-	$ -	-	$ -	-	$ -	$ -	$ -
Miscellaneous	-	$ -	-	$ -	-	$ -	$ -	$ -
Primary Resource Industries	-	$ -	-	$ -	-	$ -	$ -	$ -
Schools K-12	-	$ -	-	$ -	-	$ -	$ -	$ -
Stone, Clay, Glass & Concrete	-	$ -	-	$ -	-	$ -	$ -	$ -
Textiles & Leather	-	$ -	-	$ -	-	$ -	$ -	$ -
Transportation Equipment	-	$ -	-	$ -	-	$ -	$ -	$ -
Warehouse	-	$ -	-	$ -	-	$ -	$ -	$ -
Water & Wastewater	-	$ -	-	$ -	-	$ -	$ -	$ -
Total			**-**		**-**			

7 Program Potential

7.1 DSM Program Assessment and Screening

7.1.1 Review of current and proposed programs

Nexant's development of program potential estimates began with a review of existing Duke Energy DSM programs to identify the objectives, target markets, existing measures, and delivery mechanisms of each. Program information reviewed included program regulatory filings, recent program evaluation reports, and publicly available program information on Duke's website or in program marketing literature. After completing the initial program data review, Nexant coordinated multiple meetings with Duke Energy product development and DSM program staff to assist in our understanding of current and proposed DSM initiatives, details of South Carolina-specific market conditions, and the suitability of certain efficiency measures, groups of measures, and programs for the given customer base.

7.1.2 Development of proposed offerings

Based on existing programs and measure list developed for the study, Nexant worked with Duke Energy to identify and develop proposed program offerings to be considered in this study. Each eligible EE measure was mapped to one or more program offerings across the Residential, Commercial, and Industrial customer segments, and DR opportunities were classified into specific offerings across the customer segments.

In refining the program offerings, the cost-effectiveness of each offering was analyzed from the TRC perspective. While the measure bundles that comprised the programs may have included measures that did not pass the TRC on their own, the goal of the measure bundling into programs was to achieve programs that passed the TRC.

The following tables describe the final EE and DR program offerings included in the study.

Table 7-1: Proposed Residential EE Program Offerings

Program	Description	Targeted Segments	Delivery Approach
Smart $aver	Contractor-driven program addressing need for HVAC equipment, water heating equipment, building envelope, and pool measures	All residential building types	*Marketing strategy:* target customer segment *Customer experience:* technical assistance *Incentive type:* customer rebate
Energy Efficient Lighting	Program is designed to offer energy efficient lighting measures through different channels, such as buy-downs, giveaway, retail stores, and online store.	All residential building types	*Marketing strategy:* mass marketing and joint marketing *Customer experience:* self-directed *Incentive type:* customer rebate

Program	Description	Targeted Segments	Delivery Approach
Appliance Recycling	Offer rebates to the residential customers who have qualifying units for recycling. The incentives will be offered after the units are picked up by Duke Energy's contractor.	Single Family	*Marketing strategy:* mass marketing *Customer experience:* self-directed *Incentive type:* customer rebate
Audits and EE Kits	Focuses on energy efficiency education on customers and installation of highly cost-effective measures.	All residential building types; note: decision-maker varies by building type	*Marketing strategy:* mass marketing *Customer experience:* direct install & behavior *Incentive type:* customer rebate
EE Products	Designed to deliver energy efficiency upgrades on typical residential appliances that can be self-installed by residential customers.	All residential building types	*Marketing strategy:* mass marketing & joint marketing *Customer experience:* self-directed *Incentive type:* customer rebate
Income Qualified	Addresses the approach of centralized management and existing resources for low income community to support energy efficiency.	All residential building types, demographic limitations	*Marketing strategy:* target customer segment *Customer experience:* technical assistance & direct install *Incentive type:* customer rebate
New Construction	Targets energy efficiency whole building measures and individual high cost-effective measures for new homes.	All residential building types (new construction)	*Marketing strategy:* joint marketing *Customer experience:* technical assistance *Incentive type:* customer rebate
Behavioral	Provides customers with increased information on their home energy consumption and tips to reduce energy use. Information provided through periodic usage reports as well as direct feedback with real-time usage information for their home.	All residential building types	*Marketing strategy:* target customer segment *Customer experience:* behavioral *Incentive type:* N/A

Table 7-2: Proposed Non-Residential EE Program Offerings

Program	Description	Targeted Segments	Delivery Approach
Smart $aver-Prescriptive	Addresses need to overcome cost barriers and increase efficiency of commercial and industrial equipment. Offers incentives to businesses for installing energy efficiency equipment.	All non-residential building types	*Marketing strategy:* target customer segment *Customer experience:* self-directed *Incentive type:* customer rebate
Smart $aver – Custom	Addresses need of Duke Energy customers with measures not fall in the Smart $aver prescriptive incentive program measure list. Offers incentives to businesses for installing energy efficiency equipment.	All non-residential building types	*Marketing strategy:* target customer segment *Customer experience:* technical assistance *Incentive type:* customer rebate
Small Business Energy Saver	Focuses on installing highly-cost effective measures while minimizing customers' participation burden with a direct install approach.	Non-residential small business customers (less than 100 kW demand)	*Marketing strategy:* target customer segment *Customer experience:* direct install *Incentive type:* upstream incentive/mark-down
New Construction	Influences the design and construction phase of the commercial real estate market. Offers design assistance and cash incentives for a package of whole-building energy opportunities.	All non-residential building types	*Marketing strategy:* target customer segment *Customer experience:* technical assistance *Incentive type:* customer rebate
Pay-for-Performance	Offering measures are similar to Smart $aver-Custom Program with part of the incentives paid a year later to customers.	All non-residential building types	*Marketing strategy:* target customer segment *Customer experience:* technical assistance *Incentive type:* customer rebate
Behavioral	Provides customers with increased information on facility energy consumption and tips to reduce energy use. Information provided through periodic usage reports as well as direct feedback with real-time usage information for their business. Initiative may also include competitions and gamification.	All non-residential building types, primarily small and medium business customers	*Marketing strategy:* target customer segment *Customer experience:* behavioral *Incentive type:* N/A

Table 7-3: Proposed Demand Response Program Offerings

Type of DR	Sector	Technology	Existing Program?
Utility controlled loads	Residential	▪ Central AC switches	Y
		▪ Smart thermostat	N
		▪ Water heater switches	Y
		▪ Home gateway (control HVAC, water heater, pool pumps, power strips	N
		▪ Pool pumps	N
	Non-Residential	▪ Lighting controls (EMS or lighting ballasts)	N
		▪ HVAC controls (EMS)	N
		▪ Pump loads	N
		▪ Auto DR for process loads	N
		▪ Battery storage	N
		▪ Backup generation	Y
Contractual	Non-Residential	▪ Interruptible rates – Firm service levels	Y
		▪ Guaranteed Load Drop	Y
		▪ Emergency Load Response	Y
Voluntary	Residential	▪ Behavioral DR	N
	Non-Residential	▪ Economic Load Response	Y

7.2 EE Market Potential Methodology

7.2.1 Market Adoption Rates

Utility-sponsored DSM programs offer incentives for energy efficiency measures that are designed to lower customers' costs and increase the rate at which the market adopts energy efficiency technologies. To estimate the adoption rate of energy efficiency based on the proposed program offerings described above, Nexant incorporated Duke DSM program data as well as secondary data from other utility sponsored DSM initiatives. Nexant included secondary data on program performance because the period of program performance data available from Duke Energy was not long enough to make statistical projections of future participation rates. This situation is not unique to Duke Energy; most jurisdictions have relatively short DSM program histories. Nexant developed an approach to overcome this issue by combining program performance data on many utilities and conducting a meta-analysis of program performance that generally describes customers' program adoption rates. As described below, Nexant estimates a calibrated program participation model by combining meta-analysis adoption parameters with historic Duke Energy program performance data.

Nexant used historic Duke Energy program participation data to derive estimates of baseline program penetration (or participation) rates. Participation in Duke Energy's most recent program year prior to the MPS is taken as the baseline cumulative penetration rate. Nexant developed estimates of future program adoption using secondary research and standard economic theories on product diffusion. Forecasting future market penetration beyond the most recent program participation rate requires assumptions about the ultimate market penetration for a given program or set of measures, and information on the expected rate of market diffusion or uptake.

Nexant considered on a number of secondary data sources to develop market adoption parameters. These sources include EPA Energy Star data on qualified product shipments, empirically-derived market penetration curves from other utility-sponsored programs, and primary research conducted in other markets. The use of secondary data for estimating market penetration is based on aligning energy efficiency measures with program concepts designed to address specific market segments and the varieties of DSM measures widely available in and suitable for the South Carolina market.

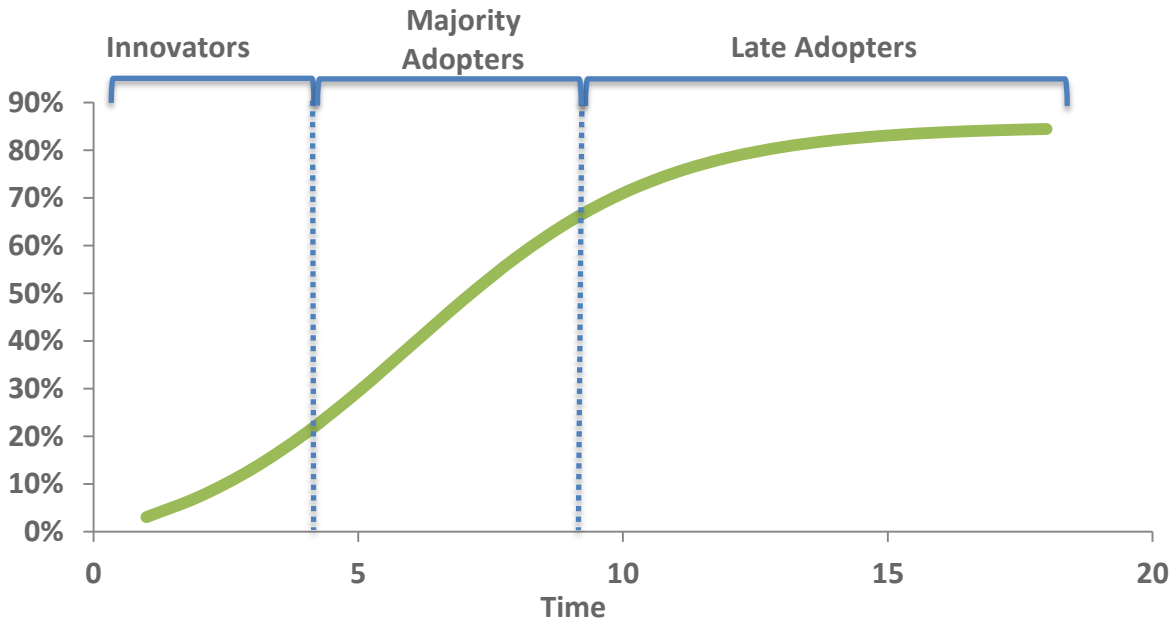
The technical and economic potential included in this study are theoretical constructs that assume 100% adoption of energy efficiency technologies over an extended period of time, including the assumption that there will be an in-kind, replacement measure to replace the transformed current measure. However, the energy efficiency market potential incorporates Nexant's market penetration estimates, which follow accepted theories of product diffusion. This theoretical model of market adoption, referred to as the Bass Diffusion Model, is a widely accepted mathematical description of how new products and innovations spread through an economy over time. The Bass Diffusion Model was originally published in 1969, and in 2004 was voted one of the top 10 most influential papers published in the 50 year history of the peer-reviewed publication *Management Science*[1]. More recent publications by Lawrence Berkeley National Laboratories have illustrated the application of this model to CDM in the energy industry[2]. Nexant applied the secondary data and research collected to develop and apply Bass Model diffusion parameters in the South Carolina jurisdiction.

According to product diffusion theory, the rate of market adoption for a product changes over time. When the product is introduced, there is a slow rate of adoption while customers become familiar with the product. When the market accepts a product, the adoption rate accelerates to relative stability in the middle of the product cycle. The end of the product cycle is characterized by a low adoption rate because fewer customers remain that have yet to adopt the product. This concept is illustrated in Figure 7-1.

[1] Bass, F. 2004. Comments on "A New Product Growth for Model Consumer Durables the Bass Model" (sic). *Management Science* 50 (12_supplement): 1833-1840. http://pubsonline.informs.org/doi/abs/10.1287/mnsc.1040.0300. Accessed 01/08/2016.

[2] Buskirk, R. 2014. Estimating Energy Efficiency Technology Adoption Curve Elasticity with Respect to Government and Utility Deployment Program Indicators. LBNL Paper 6542E. Sustainable Energy Systems Group, Environmental Energy Technologies Division. Ernest Orlando Lawrence Berkeley National Laboratory. http://escholarship.org/uc/item/2vp2b7cm#page-1. Accessed 01/14/2016.

Figure 7-1: Bass Model Market Penetration with Respect to Time



The Bass Diffusion model is a mathematical description of how the rate of new product diffusion in a market changes over time. Figure 1 depicts the cumulative market adoption with respect to time, $S(t)$. The rate of adoption in a discrete time period is determined by external influences on the market, internal market conditions, and the number of previous adopters. The following equation describes this relationship:

$$\frac{dS(t)}{dt} = \left(p + \frac{q}{m} * S(t-1)\right) * (m - S(t-1))$$

Where:

$\frac{dS(t)}{dt}$ = the rate of adoption for any discrete time period, *t*

p = external influences on market adoption

q = internal influences on market adoption

m = the maximum market share for the product

$S(t-1)$ = the cumulative market share of the product, from product introduction to time period *t-1*

Marketing is the quintessential external influence. The internal influences are characteristics of the product and market; for example: the underlying market demand for the product, word of mouth, product features, market structure, and other factors that determine the product's market performance. Nexant's approach applied literature reviews and analysis of secondary data sources to estimate the Bass model parameters. We then extrapolated the model to future years; the historic participation and predicted future market evolution serve as the program

adoption curve applied to each proposed offering.

7.2.2 Scenario Analysis

The market potential for the proposed energy efficiency program offerings was developed based on two program potential scenarios, each with specific assumptions on the types of programs and eligible measures offered. The two scenarios were developed as follows:

- Base scenario – aligns with existing program portfolio, and includes existing EE programs and measures currently offered by DEC or DEP
- Enhanced scenario – includes existing EE programs with measure bundles that include current and newly proposed measures, as well as new EE programs where measures included in the study did not logically fit into an existing offering.

Table 7-4 summarizes the programs and measures considered in each scenario:

Table 7-4: EE Programs by Scenario

	Program	Included in Base Scenario?	Included in Enhanced Scenario?
Residential	Smart $aver	Yes, Existing measures only	Yes, Existing + new measures
	Energy Efficient Lighting	Yes, Existing measures only	Yes, Existing + new measures
	Appliance Recycling	Yes, Existing measures only	Yes, Existing + new measures
	Audits and EE Kits	Yes, Existing measures only	Yes, Existing + new measures
	EE Products	No	Yes, New program and measures
	Income Qualified	Yes, Existing measures only	Yes, Existing + new measures
	New Construction	Yes (DEP), No (DEC)	Yes, Existing + new measures
	Behavioral	Yes, Existing measures only	Yes, Existing + new measures
Non-Residential	Smart $aver - Prescriptive	Yes, Existing measures only	Yes, Existing + new measures
	Smart $aver - Custom	Yes, Existing measures only	Yes, Existing + new measures
	Pay-For-Performance	Yes, Existing measures only	Yes, Existing + new measures
	Small Business	Yes, Existing measures only	Yes, Existing + new measures
	New Construction	Yes, Existing measures only	Yes, Existing + new measures
	Behavioral	Yes, Existing measures only	Yes, Existing + new measures

7.3 DR Market Potential Methodology

7.3.1 Estimation of Participation Rates for DR Programs

While economic potential merely considers whether a given customer segment is worth pursuing based on the marginal net benefits provided by those customers, achievable potential takes into account the estimated participation rate and how that affects the overall cost-effectiveness of the customer segment.

The magnitude of DR resources that can be acquired is fundamentally the result of customer preferences, program or offer characteristics (including incentive levels), and how programs are marketed. How predisposed are specific customers to participate in DR? What are details of specific offers and how do they influence enrollment rates? What is the level of marketing intensity and what marketing tactics are employed?

For program-based DR, participation rates are calculated as a function of the incentives offered to each customer group. For a given incentive level and participation rate, the cost-effectiveness of each customer segment is evaluated to determine whether the aggregate DR potential from that segment should be included in the achievable potential.

The following subsections describe how marketing/incentive level, participation rates, and technology costs are handled by this study.

7.3.2 Marketing and Incentive Levels for Programs

Several underlying assumptions are used to define three different marketing levels. The number of marketing attempts and the method of outreach are varied by marketing level, as described in Table 7-5. The high scenario assumes a high marketing level for program-based DR, while the medium scenario assumes a medium marketing level and the low scenario assumes a low marketing level. Within each marketing level, the participation rate for each customer segment is a function of the incentive level.

The specific tactics included in the low, medium, and high marketing scenarios are not prescriptive but are instead designed to provide concrete details about the assumptions used in the study. There is a wide range of strategies and tactics that can attain the same enrollment levels and the best approach for a jurisdiction is best developed through testing and optimizing the mix of marketing tactics and incentives.

Table 7-5: Marketing Inputs for Residential Program Enrollment Model

	Input	Marketing Level			
		No Marketing	Low	Medium	High
Marketing Components	Number of marketing attempts (Direct mail)	0	3	3	5
	Outreach mode	No marketing	Direct Mail	DM + Phone	DM + Phone
	Installation required (%)	0%	70%	70%	70%

The incentive level and marketing inputs for each scenario determine the participation rate, assuming that the incentive is uniform across all customer segments within a given customer

class.

7.3.3 Participation Rates

The participation models for the residential and nonresidential customer segments use a bottom up approach to estimate participation rates. These estimates have been crosschecked with mature programs in other jurisdictions to ensure that the estimated participation rates are reasonable.

Many DR potential studies rely on top down approaches which benchmark programs against enrollment rates that have been attained by mature programs. However, aggregated program results often do not provide enough detail to calibrate achievable market potential. In many cases, programs are not marketed to all customers, either because it is not cost-effective to market to all customers or budgets are capped by regulators. Enrollment rates are a function of specific offers and the extensiveness of marketing over many years. They also vary based on the degree to which DR resources are utilized and tend to be higher when payments are high but actual events are infrequent, particularly among large C&I customers.

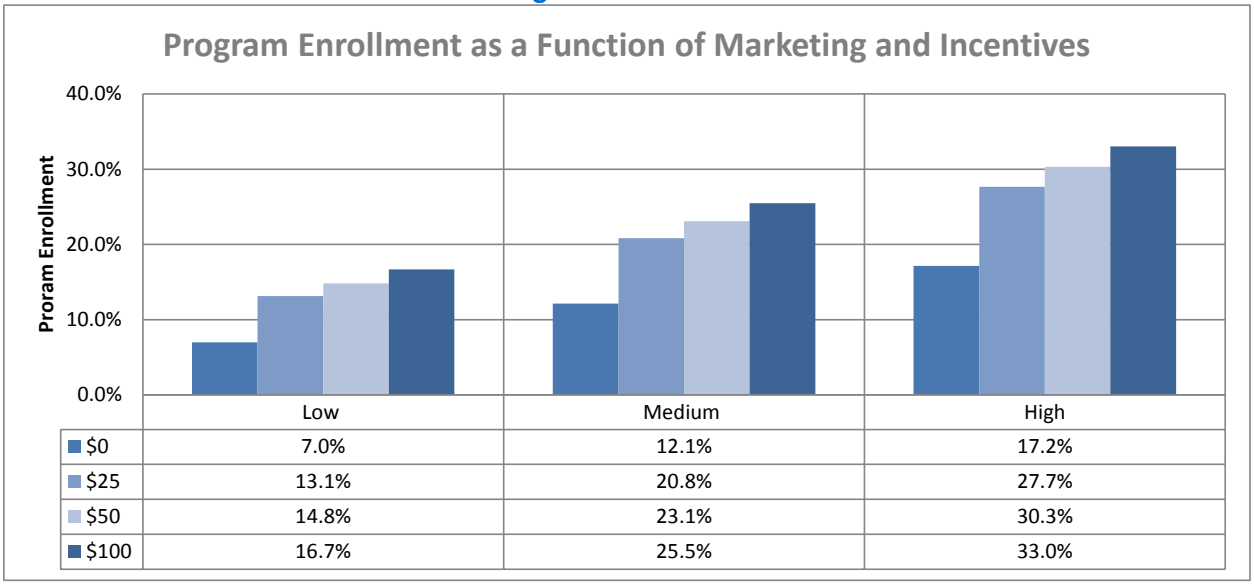
For residential customers, the Nexant approach to estimate participation rates involves five steps. The initial step required some modification due to the data provided (or lack thereof).

1) Estimate an econometric choice model based on who has and has not enrolled in DR programs. The goal is to estimate the pre-disposition or propensity of different customers to participate in DR based on their characteristics. Because micro-level acquisition marketing data were not provided, we relied on differences in participation rates by usage level, electric heating and income level. This information is based on prior micro-level analysis of program participation by Nexant and supplemented by outbound acquisition marketing that Nexant implements for load control programs.
2) Incorporate information about how different offer characteristics influence enrollment likelihood. What is the incremental effect of incentives? How do requirements for on-site installation affect enrollment rates? The two questions above have been analyzed using California specific data for residential customers. In each case, regression coefficients describe the incremental effect of each of the above factors on participation rates.
3) Incorporate information about how marketing tactics and intensity of marketing influence participation rates. What is the effect of incremental acquisition attempts? Is there a bump in enrollment rates when phone and/or door-to-door recruitment is added to direct mail recruitment? This relies on data from side-by-side testing designed to explicitly quantify the effect of marketing tactics on enrollment rates.
4) Calibrate the models to reflect actual enrollment rates attained with mature programs. To calibrate the models, the constant is adjusted so that the model produces exactly the enrollment rates observed by mature programs used for benchmarking.
5) Predict participation rates using specific tactics and incentive levels for programs with

and without installation requirements. The enrollment estimates were produced for low, medium, and high marketing levels, where specific marketing tactics are specified for each scenario. All estimates reflect enrollment rates for eligible customers.

As a demonstration of how marketing level and incentive affects participation in DR programs, Figure 7-2 shows the range of participation rates for each marketing level for a given residential customer segment at several different incentive levels.

Figure 7-2: Program Enrollment for Residential Customer Segments Under Different Marketing and Incentive Levels



	Low	Medium	High
$0	7.0%	12.1%	17.2%
$25	13.1%	20.8%	27.7%
$50	14.8%	23.1%	30.3%
$100	16.7%	25.5%	33.0%

For SMB customers (300 kW or less), a similar approach was used to estimate participation levels. However, these customers tend to have lower enrollments than larger nonresidential customers, and were scaled accordingly. SMB customers tend to exhibit roughly 40% of the uptake of residential customers, based on data from California utilities, which have extensively marketed these programs.

For large nonresidential customers, enrollment levels were predicted as a function of load rather than the number of customers, since large customers tend to have relatively high participation rates and commit to relatively large demand reductions on a percentage basis. For these customers, publicly available data on DR programs offered by California utilities were used to model program participation rates. Participation data were combined with data from the utilities on customer size and industry to generate a breakdown of participation rates, which is summarized in Table 7-6.

Table 7-6: Large Nonresidential Participation Rates by Size and Industry

Industry	Annual Max Demand (Non-coincident)				Total
	100kw - 300kW*	300 - 500kW	500kW - 1MW	1 MW or more	
Agriculture, Mining & Construction	19.8%	43.2%	57.9%	60.7%	**44.6%**
Manufacturing	24.2%	44.8%	52.3%	74.0%	**64.6%**
Wholesale, Transport & Other Utilities	27.9%	50.1%	55.7%	60.8%	**49.7%**
Retail Stores	28.1%	53.0%	53.8%	48.0%	**42.7%**
Offices, Hotels, Finance, Services	13.0%	26.9%	34.3%	40.2%	**30.0%**
Schools	15.0%	30.5%	40.3%	52.5%	**35.7%**
Institutional/Government	13.7%	34.1%	42.8%	62.3%	**40.4%**
Other or Unknown	9.4%	25.3%	29.6%	29.5%	**18.6%**
Total	**19.7%**	**40.8%**	**45.6%**	**60.8%**	**45.4%**

These programs have been marketed to every large nonresidential customer in California, which is why California specific data reflect a saturated market and a good representation of the total potential. The main gap in applying these participation rates is the ability to use back-up generation for DR. California does not allow the use of backup generation for DR while South Carolina does.

For each large nonresidential customer segment, participation was estimated as a function of incentive level and number of dispatch hours, based on publicly available information on program capacity, dispatch events, and incentive budgets.

Finally, these models were calibrated to reflect actual enrollment from DEC marketing initiatives for the Power Manager® (residential) and PowerShare® (nonresidential) programs and DEP marketing initiatives for EnergyWise®. The marketing initiatives for DEP's Demand Response Automation Program were not used for calibration because, as an automation program, it does not fully reflect the potential available from non-automated programs which can take advantage of a much wider range of end-uses/customer types. As such, the calibration from DEC's PowerShare® were applied to DEP's nonresidential sector instead.

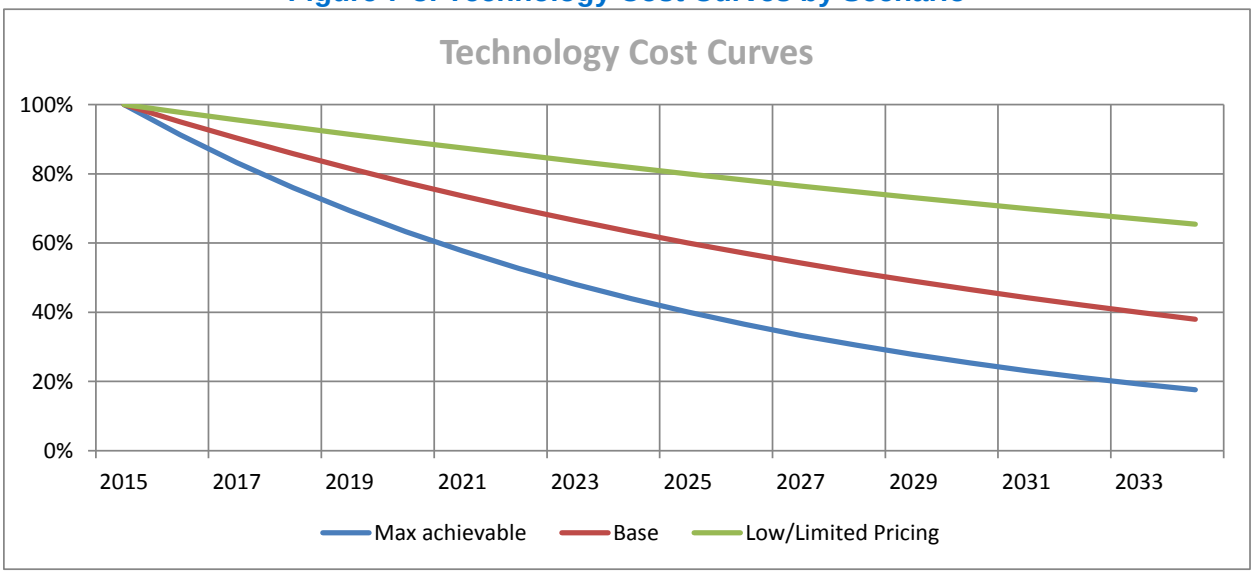
7.3.4 Technology Cost Reduction

The assumed technology costs vary for the various scenarios, as illustrated by

Figure 7-3 shows the relative decrease in equipment costs for the various scenarios over time. Whereas the base scenario assumes a 40% reduction in technology costs from existing prices by 2025, the high scenario assumes a 60% reduction and the low scenario assumes a 20% reduction. A key assumption in the DR technology costs curves is that DR-ready devices and equipment will become more common, requiring utilities to purchase and install less equipment. Because of changes in code and changes in appliance/building stock, an increasing share of

customers is expected to have DR-capable thermostats and energy management systems installed on their own. The utility pays an incentive to connect these customers to the Demand Response Management System (DRMS), but avoids having to pay for technology and installation, driving down program technology costs.

Figure 7-3: Technology Cost Curves by Scenario



Another relevant factor in the calculation of equipment costs is the expected penetration of smart thermostats. Customer uptake of these devices is incentivized by the energy efficiency programs described in this report in the medium and high scenarios, leading to a 62% penetration by 2040 in both of those scenarios. Customers who already have smart thermostats would not incur equipment costs, thus making them more cost effective to enroll in DR.

7.3.5 Scenario Analysis

Low, medium, and high scenarios were constructed for the DR potential analysis, which align with the assumptions for the EE scenarios (notably, the penetration of smart thermostats). Other major assumptions for each scenario are listed below:

Low, medium, and high scenarios were constructed for the DR potential analysis of the programs listed above. Major assumptions for each scenario are listed below:

Program Potential - Low

- Continue existing programs and maintain incentives at current levels for residential and nonresidential customers
- Only target residential AC/heating (no pool pumps or water heaters)
- No incentives for purchase of smart thermostats
- Limited program marketing and outreach budgets
- Target only customer segments who are cost-effective on their own

- Assume very little technology cost reduction

Program Potential - Medium

- Include a behavioral DR product for MyHER and BER participants (incremental 0.75% usage reduction)
- Double incentives for residential and nonresidential customers compared to current levels
- Also target water heater loads for residential customers
- Offer incentives for smart thermostats
- Increased program marketing and outreach budgets
- Loosen calipers on customer segments to target all economic segments
- Assume modest technology cost reductions

Program Potential - High

- Include behavioral demand response (same as medium scenario)
- Triple incentives for residential and nonresidential customers compared to current levels
- Target pool pumps for residential customers
- Offer incentives for smart thermostats
- Aggressively increase program marketing and outreach budgets
- Target all customer segments that can be included without making the program cost-ineffective
- Assume large technology cost reductions

7.4 DEC Energy Efficiency Program Potential

This section provides the results of the DEC EE achievable program potential for each of the three segments.

7.4.1 Summary

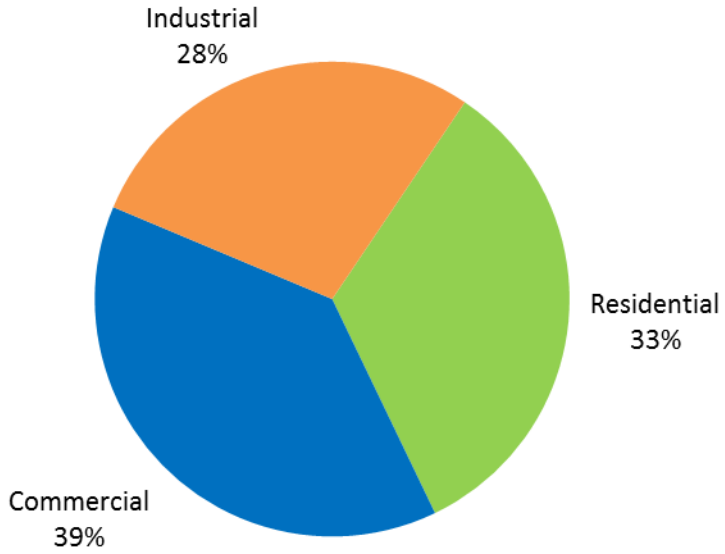
Table 7-7 summarizes the short-term (5-year), medium term (10-year) and long-term (25-year) DEC portfolio EE program potential for the base and enhanced scenarios. Impacts are presented as both **cumulative impacts**, which represent the savings that occur in the respective year based on measures installed in that year and measures installed in prior years that have not reached the end of their useful life and **the sum of annual impacts**, which represent the total annual incremental savings achieved over the stated time horizon (5 years, 10 years, or 25 years).

Table 7-7: DEC EE Program Potential

	Base Scenario		Enhanced Scenario	
	Total Potential	% of Load[3]	Total Potential	% of Load[5]
5-yr (2021) impacts				
Cumulative MWh	404,886	1.8%	601,442	2.7%
Cumulative MW	99.0		156.6	
Sum of Annual MWh	588,237	2.6%	814,771	3.6%
Sum of Annual MW	121.7		183.1	
10-yr (2026) impacts				
Cumulative MWh	718,258	3.0%	1,104,969	4.6%
Cumulative MW	180.4		303.5	
Sum of Annual MWh	1,193,527	5.0%	1,708,957	7.2%
Sum of Annual MW	245.4		387.7	
25-yr (2041) impacts				
Cumulative MWh	1,195,076	4.1%	1,636,894	5.6%
Cumulative MW	285.0		413.5	
Sum of Annual MWh	3,247,150	11.2%	4,592,900	15.8%
Sum of Annual MW	663.1		1,009.6	

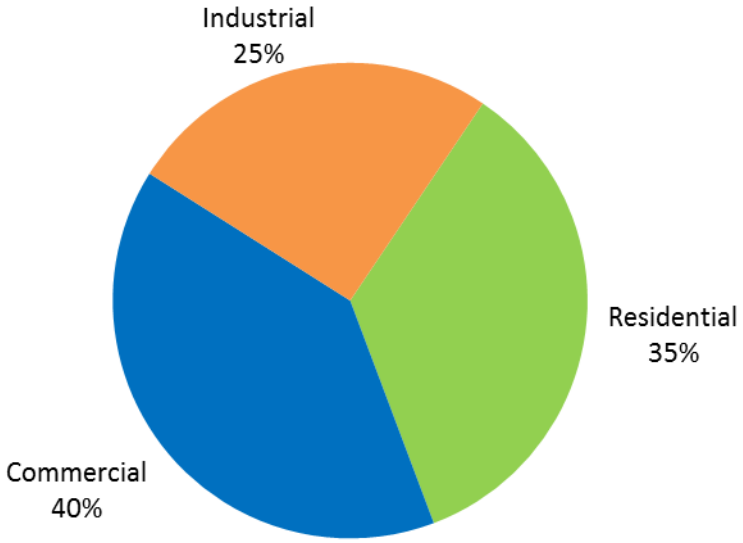
Figure 7-4 and Figure 7-5 show DEC achievable energy savings potential by sector for each scenario.

Figure 7-4: DEC Achievable Program Potential by Sector – Base Scenario



[33] Based on baseline sales forecast in 2021, 2026, and 2041, for 5-yr, 10-yr, and 25-yr impacts, respectively

Figure 7-5: DEC Achievable Program Potential by Sector – Enhanced Scenario



Participant and program costs associated with achievable program potential scenarios include the following:

- **Program incentives:** Financial incentives paid by energy-efficiency programs to subsidize purchases of energy-efficiency measures.
- **Program administration costs:** Administrative, marketing, promotional, and other costs associated with managing programs designed to achieve energy-efficiency savings.
- **Total program acquisition costs:** Total incentive and non-incentive program costs per sum of annual incremental energy savings achieved.
- **Participant costs:** Incremental costs to purchase, install, and maintain energy-efficiency measures.

Table 7-8 lists estimated participant and program costs associated with the theoretically achievable scenarios over the first 5 program years.

Table 7-8: DEC Participation and Program Costs by Scenario (cumulative through 2021)

Program Sector	Program Incentives ($M)	Program Admin ($M)	Participant Costs ($M)	Levelized Cost[4] ($M)
Base Scenario				
Residential	$68.2	$34.5	$146.9	$0.098
Non-Residential	$33.7	$8.6	$99.1	$0.037
Total	$101.9	$43.1	$246.0	$0.064
Enhanced Scenario				
Residential	$77.0	$50.5	$157.1	$0.086
Non-Residential	$50.0	$13.6	$131.2	$0.038
Total	$127.0	$64.1	$288.3	$0.058

7.4.2 Residential Program Details

Table 7-9 summarizes the short-term (5-year), medium term (10-year) and long-term (25-year) cumulative residential energy efficiency program potential for the base and enhanced scenarios. Impacts are presented as both **cumulative impacts**, which represent the savings that occur in the respective year based on measures installed in that year and measures installed in prior years that have not reached the end of their useful life and **the sum of annual impacts**, which represent the total annual incremental savings achieved over the stated time horizon (5 years, 10 years, or 25 years):

[4] Levelized cost presented from the TRC perspective. Program potential costs include both incremental measure costs and program delivery and administrative costs.

Table 7-9: EE Residential Program Potential

	Base Scenario		Enhanced Scenario	
	Total Potential	% of Residential Load[5]	Total Potential	% of Residential Load[5]
5-yr (2021) impacts				
Cumulative MWh	179,445	2.6%	249,620	3.6%
Cumulative MW	57.0		83.8	
Sum of Annual MWh	362,123	5.3%	452,275	6.6%
Sum of Annual MW	79.5		108.6	
10-yr (2026) impacts				
Cumulative MWh	279,545	4.1%	408,440	5.9%
Cumulative MW	100.2		153.7	
Sum of Annual MWh	727,912	10.6%	935,059	13.6%
Sum of Annual MW	158.6		220.9	
25-yr (2041) impacts				
Cumulative MWh	399,347	5.8%	569,974	8.3%
Cumulative MW	136.8		210.8	
Sum of Annual MWh	1,886,289	27.4%	2,521,873	36.6%
Sum of Annual MW	399.0		580.3	

Figure 7-6 and Figure 7-7 illustrate the relative contributions to the overall residential program potential by program for the base and enhanced scenarios.

[5] Based on baseline sales forecast in 2021, 2026, and 2041, for 5-yr, 10-yr, and 25-yr impacts, respectively

Figure 7-6: DEC Residential 5-Yr Cumulative Potential by Program – Base Scenario

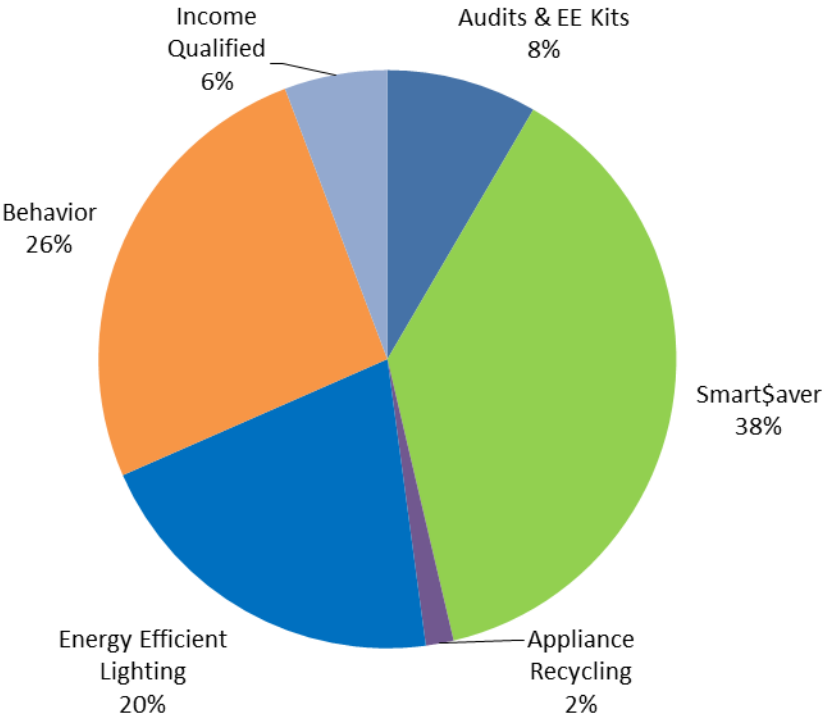
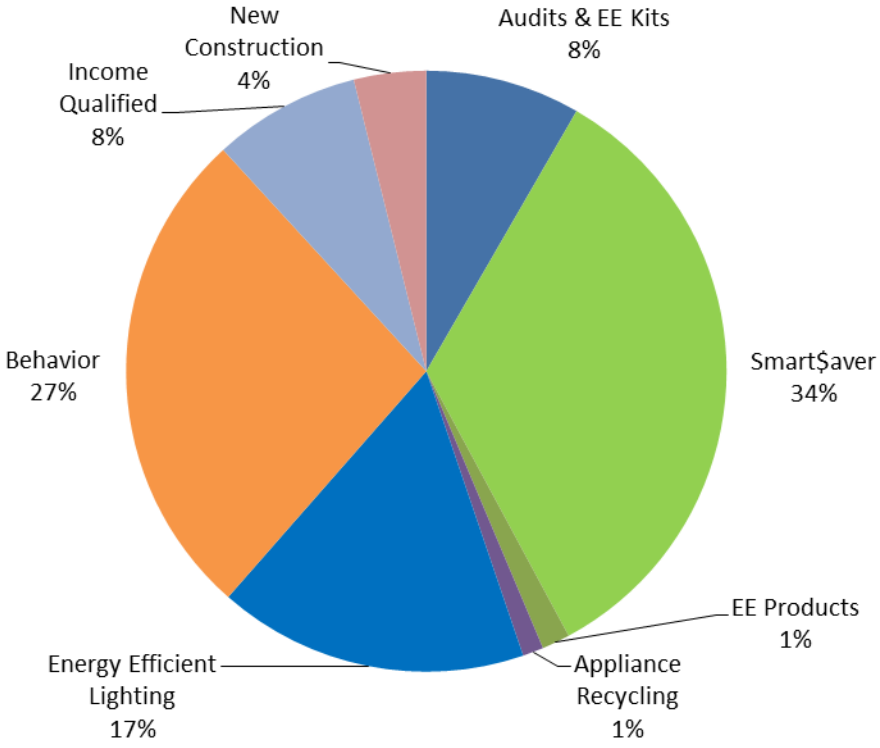


Figure 7-7: DEC Residential 5-Yr Cumulative Potential by Program – Enhanced Scenario



Detailed program results for the short-term residential EE programs are provided in Table 7-10:

Table 7-10: DEC Residential Program Potential (cumulative through 2021)

	Audits & EE Kits	Smart $aver	EE Products	Appliance Recycling	Energy Efficient Lighting	Behavioral	Income Qualified	New Const.
5-yr (2021) impacts – Base scenario								
MWh savings (cumulative)	15,120	67,988	N/A	2,800	36,882	46,310	10,345	N/A
MW savings (cumulative)	4.6	39.4	N/A	0.4	3.9	5.3	4.3	N/A
Program costs (cumulative) ($M)	$12.18	$48.36	N/A	$1.06	$11.37	$11.55	$18.18	N/A
Levelized Cost ($/kWh)	$0.082	$0.166	N/A	$0.065	$0.028	$0.050	$0.137	N/A
5-yr (2021) impacts – Enhanced scenario								
MWh savings (cumulative)	20,825	84,351	3,774	2,799	41,689	66,657	19,817	9,707
MW savings (cumulative)	5.1	47.8	0.5	0.4	4.4	11.4	10.0	5.2
Program costs (cumulative) ($M)	16.4	53.4	0.9	1.1	12.2	14.9	24.5	4.0
Levelized Cost ($/kWh)	$0.095	$0.140	$0.047	$0.068	$0.027	$0.076	$0.105	$0.115

To analyze the costs and benefits of the program potential scenarios, Nexant used a number of common test perspectives in the MPS, consistent with the California Standard Practice Manual.[6]:

- Total resource cost (TRC): Calculated by comparing the total avoided electricity production and the avoided delivery costs from installing a measure, to that measure's incremental cost. The incremental cost is relative to the cost of the measure's appropriate baseline technology.
- Utility cost test (UCT): Calculated by comparing total avoided electricity production and avoided delivery costs from installing a measure, to the utility's cost of delivering a program containing that measure. Costs include incentive and non-incentive costs.
- Participant cost test (PCT): Calculated by dividing electricity bill savings for each installed measure, by the incremental cost of that measure. The incremental cost is relative to the cost of the measure's appropriate baseline technology.
- Ratepayer Impact Measure (RIM): Calculated by comparing the total avoided electricity production and the avoided delivery costs from installing a measure, to the utility's revenue impacts from lost sales and program delivery.

Table 7-11 provides the net benefits and benefit-to-cost ratios by sector for each scenario:

[6] California Standard Practice Manual: Economic Analysis of Demand-Side Program and Projects. California Public Utilities Commission. San Francisco, CA. October 2001.

Table 7-11: Cost-Benefit Results – Residential Programs (cumulative through 2021)

	Audits & EE Kits	Smart $aver	EE Products	Appliance Recycling	Energy Efficient Lighting	Behavioral	Income Qualified	New Const.
5-yr (2021) impacts – Base scenario								
TRC – Net Benefits($M)	$12.64	$1.05	N/A	$0.25	$15.35	$2.03	-$0.66	N/A
TRC – B/C ratio	2.20	1.01	N/A	1.19	2.73	1.18	0.96	N/A
UCT – Net Benefits ($M)	$10.98	$77.30	N/A	$0.49	$12.84	$2.03	-$3.64	N/A
UCT – B/C ratio	1.90	2.60	N/A	1.46	2.13	1.18	0.80	N/A
PCT – Net Benefits ($M)	$5.44	-$35.30	N/A	$1.20	$1.45	$21.47	$8.35	N/A
PCT – B/C ratio	1.84	0.68	N/A	2.88	1.05	N/A	4.89	N/A
RIM – Net Benefits ($M)	-$0.91	$1.78	N/A	-$1.34	-$15.46	-$19.43	-$14.14	N/A
RIM – B/C ratio	0.96	1.01	N/A	0.54	0.61	0.41	0.51	N/A
5-yr (2021) impacts – Enhanced scenario								
TRC – Net Benefits($M)	$10.54	$16.42	$0.13	$0.18	$16.54	$17.17	$5.49	$4.77
TRC – B/C ratio	1.73	1.13	1.08	1.13	2.73	2.15	1.26	1.37
UCT – Net Benefits ($M)	$8.52	$93.38	$0.80	$0.42	$13.87	$17.17	$1.94	$13.80
UCT – B/C ratio	1.52	2.75	1.86	1.37	2.13	2.15	1.08	4.43
PCT – Net Benefits ($M)	$6.43	-$23.66	$1.50	$1.79	$2.26	$15.05	$14.27	$6.31
PCT – B/C ratio	1.81	0.79	23.71	42.06	1.08	N/A	4.92	2.29
RIM – Net Benefits ($M)	-$5.86	$5.35	-$0.76	-$1.41	-$17.20	$2.12	-$15.97	$2.59
RIM – B/C ratio	0.81	1.04	0.69	0.52	0.60	1.07	0.62	1.17

7.4.3 Non-Residential Program Details

Table 7-12 summarizes the short-term (5-year), medium term (10-year) and long-term (25-year) cumulative residential energy efficiency program potential for the base and enhanced scenarios, presented as both cumulative and sum of annual impacts:

Table 7-12: DEC EE Non-Residential Program Potential

	Base Scenario		Enhanced Scenario	
	Total Potential	% of Non-Res Load[7]	Total Potential	% of Non-Res Load[7]
5-yr (2021) impacts				
Cumulative MWh	225,441	1.4%	351,823	2.2%
Cumulative MW	42.1		72.8	
Sum of Annual MWh	226,113	1.4%	362,496	2.3%
Sum of Annual MW	42.1		74.5	
10-yr (2026) impacts				
Cumulative MWh	438,713	2.8%	696,529	4.4%
Cumulative MW	80.2		149.7	
Sum of Annual MWh	465,615	3.0%	773,898	4.9%
Sum of Annual MW	86.8		166.8	
25-yr (2041) impacts				
Cumulative MWh	795,729	5.1%	1,066,919	6.8%
Cumulative MW	148.1		202.7	
Sum of Annual MWh	1,360,861	8.7%	2,071,027	13.2%
Sum of Annual MW	264.1		429.3	

Figure 7-8 and Figure 7-9 illustrate the relative contributions to the overall non-residential program potential by program for the base and enhanced scenarios.

[7] Based on baseline sales forecast in 2021, 2026, and 2041, for 5-yr, 10-yr, and 25-yr impacts, respectively

Figure 7-8: Non-Residential 5-Yr Cumulative Potential by Program – Base Scenario

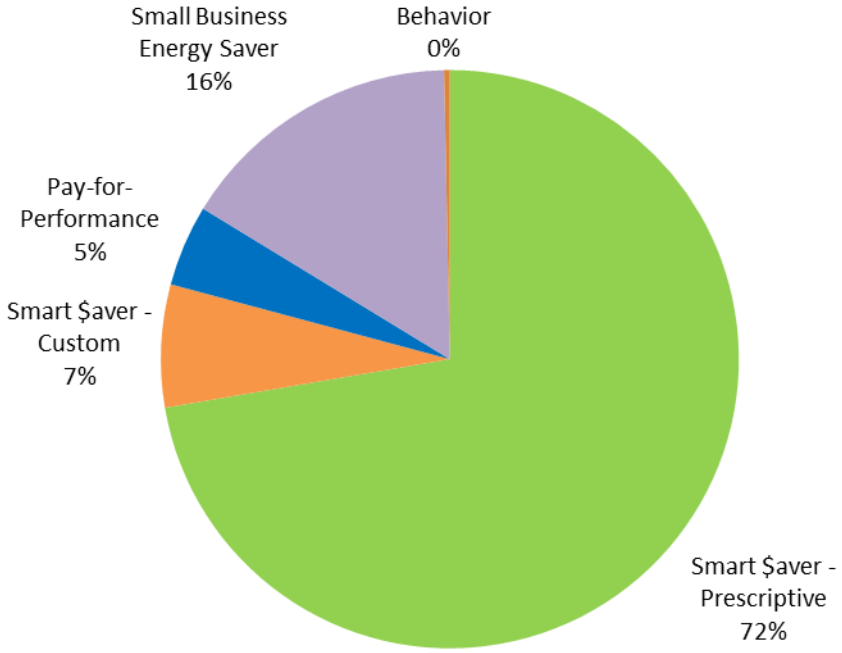
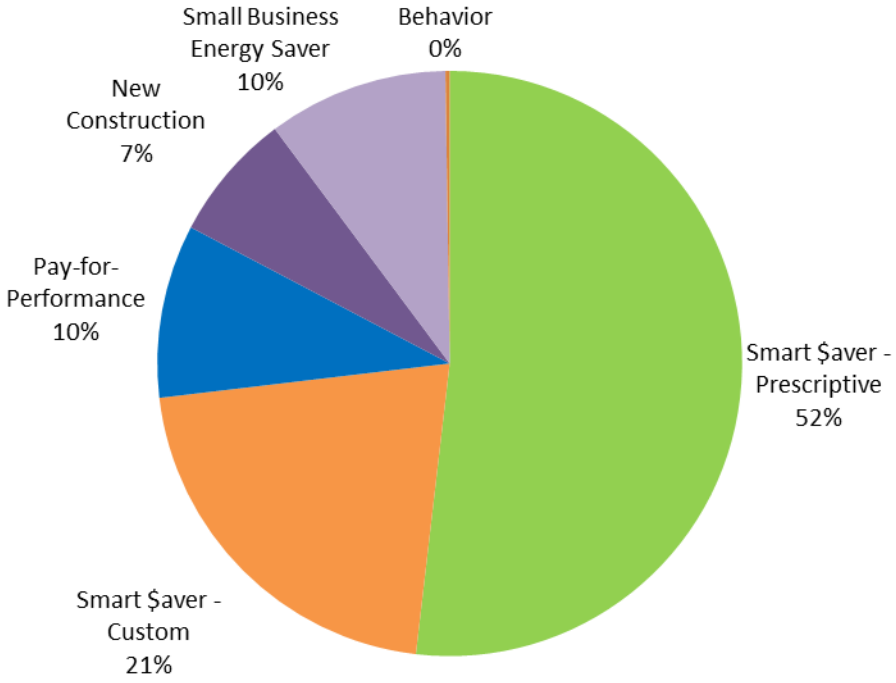


Figure 7-9: Non-Residential 5-Yr Cumulative Potential by Program – Enhanced Scenario



Detailed program results for the short-term non-residential EE programs are provided in Table 7-13:

Table 7-13: DEC Non-Residential Program Potential (cumulative through 2021)

	Prescriptive	Custom	Pay-for-Performance	New Construction	Small Business Energy Saver	Behavioral
5-yr (2021) impacts – Base scenario						
MWh savings (cumulative)	163,456	15,501	10,277	N/A	36,081	727
MW savings (cumulative)	30.6	1.8	1.8	N/A	7.9	0.1
Program costs (cumulative) ($M)	$29.12	$3.61	$1.03	N/A	$8.30	$0.24
Levelized Cost ($/kWh)	$0.038	$0.048	$0.038	N/A	$0.022	$0.070
5-yr (2021) impacts – Enhanced scenario						
MWh savings (cumulative)	179,618	73,710	33,190	24,594	34,517	820
MW savings (cumulative)	42.9	10.3	6.6	4.7	7.2	0.1
Program costs (cumulative) ($M)	$33.99	$12.57	$4.70	$3.91	$8.16	$0.24
Levelized Cost ($/kWh)	$0.042	$0.034	$0.038	$0.028	$0.026	$0.059

Table 7-15 provides the net benefits and benefit-to-cost ratios by sector for each scenario:

Table 7-14: Cost-Benefit Results – Non-Residential Programs (cumulative through 2021)

	Prescriptive	Custom	Pay-for-Performance	New Construction	Small Business Energy Saver	Behavioral
5-yr (2021) impacts – Base scenario						
TRC – Net Benefits($M)	$145.91	$5.27	$1.70	N/A	$33.52	$0.01
TRC – B/C ratio	3.44	1.78	1.88	N/A	4.95	1.02
UCT – Net Benefits ($M)	$176.62	$8.44	$2.59	N/A	$33.71	$0.01
UCT – B/C ratio	7.07	3.34	3.52	N/A	5.06	1.02
PCT – Net Benefits ($M)	$121.66	$3.37	$5.44	N/A	-$5.85	$0.00
PCT – B/C ratio	3.24	1.54	4.47	N/A	0.84	N/A
RIM – Net Benefits ($M)	$0.64	-$1.19	-$4.43	N/A	$2.57	-$0.03
RIM – B/C ratio	1.00	0.91	0.45	N/A	1.07	0.89
5-yr (2021) impacts – Enhanced scenario						
TRC – Net Benefits($M)	$158.06	$41.29	$14.12	$16.73	$29.96	$0.65
TRC – B/C ratio	3.29	2.84	2.62	3.45	4.57	3.78
UCT – Net Benefits ($M)	$193.20	$51.15	$18.14	$19.66	$30.18	$0.65
UCT – B/C ratio	6.68	5.07	4.86	6.03	4.70	3.78
PCT – Net Benefits ($M)	$107.06	$25.05	$14.93	$11.42	-$6.68	$1.60

	Prescriptive	Custom	Pay-for-Performance	New Construction	Small Business Energy Saver	Behavioral
PCT – B/C ratio	2.71	2.26	2.99	3.00	0.81	N/A
RIM – Net Benefits ($M)	$23.56	$6.15	-$4.30	$2.30	$1.34	-$0.95
RIM – B/C ratio	1.12	1.11	0.84	1.11	1.04	0.48

7.5 DEP Energy Efficiency Program Potential

This section provides the results of the DEP energy efficiency economic potential for each of the three segments.

7.5.1 Summary

Table 7-15 summarizes the short-term (5-year), medium term (10-year) and long-term (25-year) DEP portfolio EE program potential for the base and enhanced scenarios. Impacts are presented as both **cumulative impacts**, which represent the savings that occur in the respective year based on measures installed in that year and measures installed in prior years that have not reached the end of their useful life and **the sum of annual impacts**, which represent the total annual incremental savings achieved over the stated time horizon (5 years, 10 years, or 25 years).

Table 7-15: DEP EE Program Potential

	Base Scenario		Enhanced Scenario	
	Total Potential	% of Load[8]	Total Potential	% of Load[5]
5-yr (2021) impacts				
Cumulative MWh	114,106	1.7%	164,333	2.5%
Cumulative MW	24.5		39.6	
Sum of Annual MWh	191,565	2.9%	251,556	3.8%
Sum of Annual MW	33.9		50.3	
10-yr (2026) impacts				
Cumulative MWh	192,573	2.8%	290,949	4.2%
Cumulative MW	42.0		73.9	
Sum of Annual MWh	385,476	5.6%	522,808	7.5%
Sum of Annual MW	67.1		104.4	
25-yr (2041) impacts				
Cumulative MWh	307,960	3.7%	410,286	4.9%
Cumulative MW	61.8		93.3	
Sum of Annual MWh	1,030,799	12.3%	1,390,527	16.6%
Sum of Annual MW	181.3		272.0	

Figure 7-10 and Figure 7-11 show DEP achievable energy savings potential by sector for each scenario. The commercial sector accounts for more than half of the energy-savings potential, and almost two-thirds of the peak reduction potential. The industrial sector accounts for the majority of the remaining potential for electricity sales, while the residential sector accounts for the majority of the remaining peak demand reduction.

[88] Based on baseline sales forecast in 2021, 2026, and 2041, for 5-yr, 10-yr, and 25-yr impacts, respectively

Figure 7-10: DEP Achievable Program Potential by Sector – Base Scenario

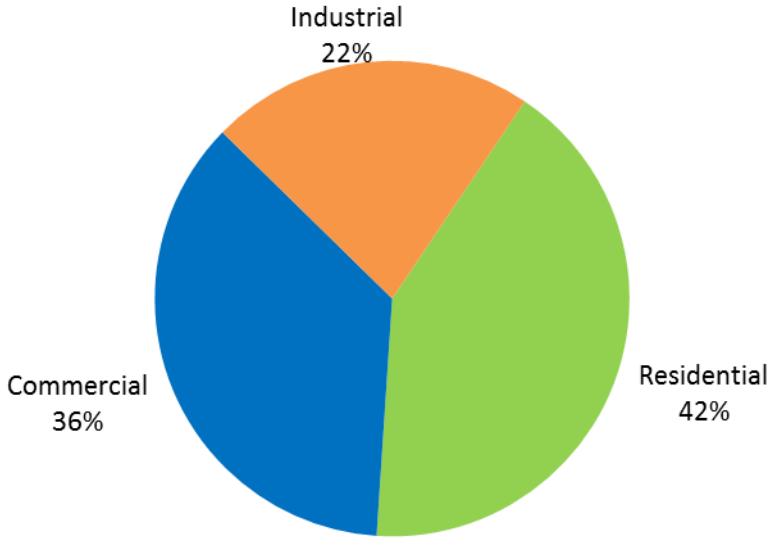
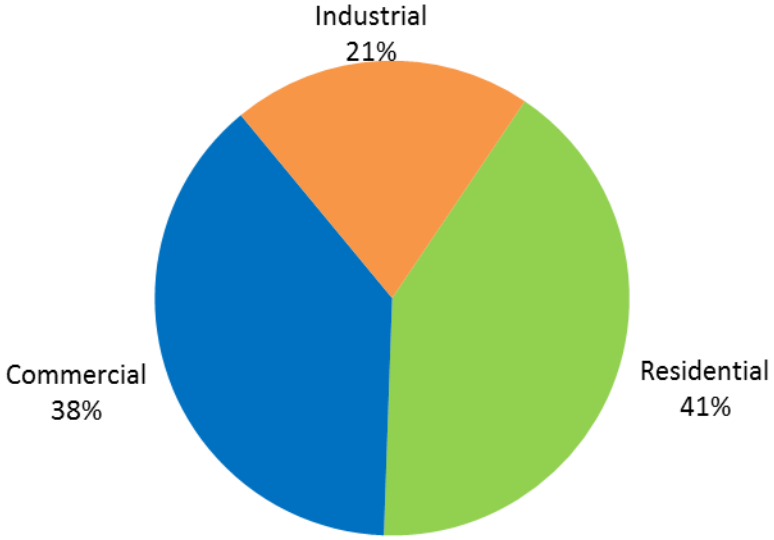


Figure 7-11: DEP Achievable Program Potential by Sector – Enhanced Scenario



Participant and program costs associated with achievable program potential scenarios include the following:

- **Program incentives:** Financial incentives paid by energy-efficiency programs to subsidize purchases of energy-efficiency measures.
- **Program administration costs:** Administrative, marketing, promotional, and other costs associated with managing programs designed to achieve energy-efficiency savings.
- **Total program acquisition costs:** Total incentive and non-incentive program costs per sum of annual incremental energy savings achieved.

- **Participant costs:** Incremental costs to purchase, install, and maintain energy-efficiency measures.

Table 7-16 lists estimated participant and program costs associated with the theoretically achievable scenarios over the first 5 program years.

Table 7-16: DEP Participation and Program Costs by Scenario (cumulative through 2021)

Program Sector	Program Incentives ($M)	Program Admin ($M)	Participant Costs ($M)	Levelized Cost ($M)
Base Scenario				
Residential	$23.9	$12.4	$55.3	$0.105
Non-Residential	$7.4	$1.9	$22.2	$0.036
Total	$31.4	$14.3	$77.5	$0.074
Enhanced Scenario				
Residential	$21.6	$17.3	$51.2	$0.083
Non-Residential	$10.7	$3.2	$28.9	$0.036
Total	$32.3	$20.4	$80.2	$0.060

7.5.2 Residential Program Details

Table 7-17 summarizes the short-term (5-year), medium term (10-year) and long-term (25-year) cumulative residential energy efficiency program potential for the base and enhanced scenarios:

Table 7-17: DEP EE Residential Program Potential

	Base Scenario		Enhanced Scenario	
	Total Potential	% of Residential Load[9]	Total Potential	% of Residential Load[5]
5-yr (2021) impacts				
Cumulative MWh	62,927	2.8%	84,218	3.7%
Cumulative MW	15.5		24.1	
Sum of Annual MWh	140,217	6.2%	168,924	7.5%
Sum of Annual MW	24.9		34.3	
10-yr (2026) impacts				
Cumulative MWh	93,434	4.1%	131,522	5.8%
Cumulative MW	24.8		41.3	
Sum of Annual MWh	279,721	12.3%	344,870	15.2%
Sum of Annual MW	48.4		68.0	
25-yr (2041) impacts				
Cumulative MWh	128,114	5.7%	168,654	7.4%
Cumulative MW	29.9		50.9	
Sum of Annual MWh	722,407	31.9%	916,329	40.4%
Sum of Annual MW	124.9		180.5	

Figure 7-12 and Figure 7-13 illustrate the relative contributions to the overall residential program potential by program for the base and enhanced scenarios.

[9] Based on baseline sales forecast in 2021, 2026, and 2041, for 5-yr, 10-yr, and 25-yr impacts, respectively

Figure 7-12: DEP Residential 5-Yr Cumulative Potential by Program – Base Scenario

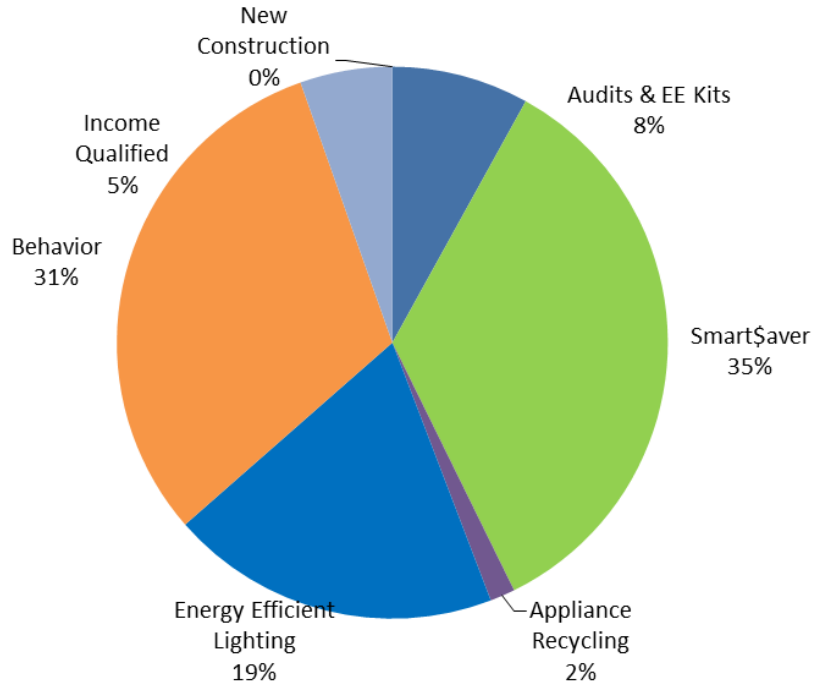
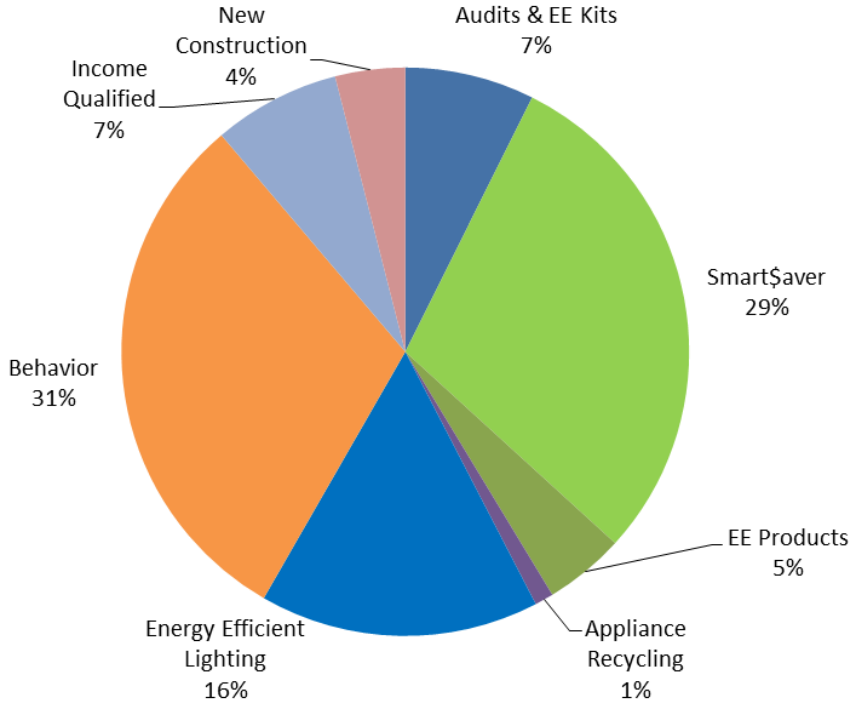


Figure 7-13: DEP Residential 5-Yr Cumulative Potential by Program – Enhanced Scenario



Detailed program results for the short-term residential energy efficiency programs are provided in Table 7-18:

Table 7-18: DEP Residential Program Potential (cumulative through 2021)

	Audits & EE Kits	Smart $aver	EE Products	Appliance Recycling	Energy Efficient Lighting	Behavioral	Income Qualified	New Const.
5-yr (2021) impacts – Base scenario								
MWh savings (cumulative)	5,064	21,813	N/A	925	12,187	19,532	3,405	N/A
MW savings (cumulative)	1.5	9.4	N/A	0.1	1.2	2.2	1.3	N/A
Program costs (cumulative) ($M)	$4.07	$17.56	N/A	$0.35	$1.82	$4.89	$7.61	N/A
Levelized Cost ($/kWh)	$0.082	$0.194	N/A	$0.065	$0.028	$0.050	$0.166	N/A
5-yr (2021) impacts – Enhanced scenario								
MWh savings (cumulative)	6,395	25,486	1,609	925	13,795	26,433	6,272	3,455
MW savings (cumulative)	1.6	12.0	0.2	0.1	1.4	4.3	3.1	0.7
Program costs (cumulative) ($M)	$5.1	$15.8	$0.4	$0.4	$2.0	$6.2	$7.6	$1.4
Levelized Cost ($/kWh)	$0.093	$0.142	$0.047	$0.068	$0.027	$0.047	$0.105	$0.109

Table 7-19 provides the net benefits and benefit-to-cost ratios by sector for each scenario:

Table 7-19: Cost-Benefit Results – Residential Programs (cumulative through 2021)

	Audits & EE Kits	Smart $aver	EE Products	Appliance Recycling	Energy Efficient Lighting	Behavioral	Income Qualified	New Const.
5-yr (2021) impacts – Base scenario								
TRC – Net Benefits($M)	$4.08	-$6.27	N/A	$0.08	$5.02	$1.13	-$0.65	N/A
TRC – B/C ratio	2.16	0.87	N/A	1.19	2.71	1.23	0.90	N/A
UCT – Net Benefits ($M)	$3.53	$23.96	N/A	$0.16	$6.13	$1.13	-$1.93	N/A
UCT – B/C ratio	1.87	2.36	N/A	1.46	4.37	1.23	0.75	N/A
PCT – Net Benefits ($M)	$2.19	-$15.93	N/A	$0.44	$1.49	$9.64	$3.12	N/A
PCT – B/C ratio	2.02	0.63	N/A	3.08	1.17	N/A	4.85	N/A
RIM – Net Benefits ($M)	-$0.81	-$3.47	N/A	-$0.49	-$4.12	-$8.50	-$5.86	N/A
RIM – B/C ratio	0.90	0.92	N/A	0.51	0.66	0.41	0.49	N/A
5-yr (2021) impacts – Enhanced scenario								
TRC – Net Benefits($M)	$3.54	$3.28	$0.05	$0.06	$5.41	$6.13	$2.22	$1.93
TRC – B/C ratio	1.79	1.08	1.07	1.13	2.71	1.99	1.34	1.44
UCT – Net Benefits ($M)	$2.91	$26.88	$0.34	$0.14	$6.56	$6.13	$1.15	$4.94
UCT – B/C ratio	1.57	2.70	1.85	1.37	4.25	1.99	1.15	4.61
PCT – Net Benefits ($M)	$2.46	-$4.45	$0.27	$0.42	$1.86	$15.58	$4.91	$2.42

	Audits & EE Kits	Smart $aver	EE Products	Appliance Recycling	Energy Efficient Lighting	Behavioral	Income Qualified	New Const.
PCT – B/C ratio	1.98	0.87	1.57	3.01	1.20	N/A	4.87	2.17
RIM – Net Benefits ($M)	-$2.06	-$2.46	-$0.39	-$0.49	-$4.69	-$9.45	-$5.03	$0.45
RIM – B/C ratio	0.80	0.95	0.65	0.51	0.65	0.57	0.63	1.08

7.5.3 Non-Residential Program Details

Table 7-20 summarizes the short-term (5-year), medium term (10-year) and long-term (25-year) cumulative residential energy efficiency program potential for the base and enhanced scenarios:

Table 7-20: DEP EE Non-Residential Program Potential

	Base Scenario		Enhanced Scenario	
	Total Potential	% of Non-Res Load[10]	Total Potential	% of Non-Res Load[5]
5-yr (2021) impacts				
Cumulative MWh	51,179	1.2%	80,115	1.9%
Cumulative MW	9.0		15.5	
Sum of Annual MWh	51,349	1.2%	82,632	1.9%
Sum of Annual MW	9.1		15.9	
10-yr (2026) impacts				
Cumulative MWh	99,138	2.3%	159,427	3.7%
Cumulative MW	17.2		32.6	
Sum of Annual MWh	105,755	2.4%	177,938	4.1%
Sum of Annual MW	18.6		36.4	
25-yr (2041) impacts				
Cumulative MWh	179,846	4.2%	241,632	5.6%
Cumulative MW	31.9		42.4	
Sum of Annual MWh	308,392	7.1%	474,198	11.0%
Sum of Annual MW	56.4		91.5	

Figure 7-14 and Figure 7-15 illustrate the relative contributions to the overall non-residential program potential by program for the base and enhanced scenarios

[10] Based on baseline sales forecast in 2021, 2026, and 2041, for 5-yr, 10-yr, and 25-yr impacts, respectively

Figure 7-14: DEP Non-Residential 5-Yr Cumulative Potential by Program – Base Scenario

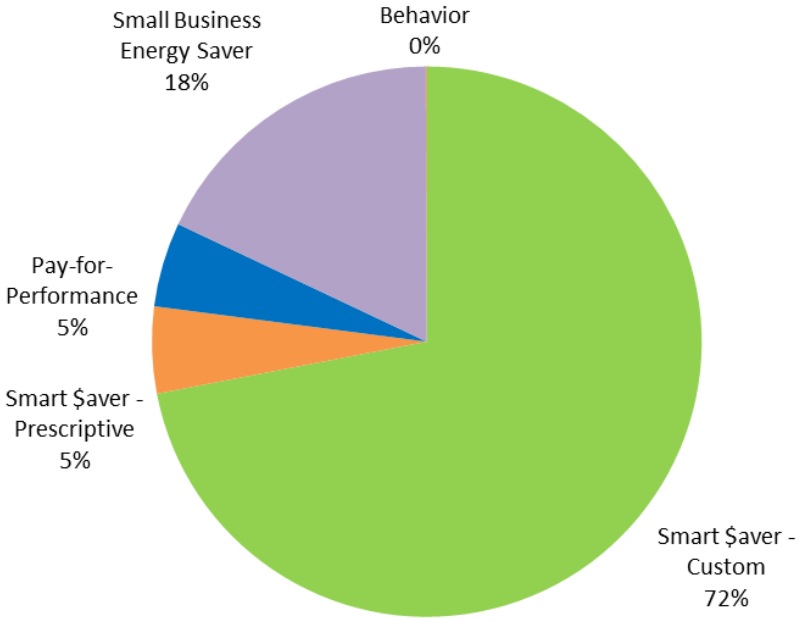
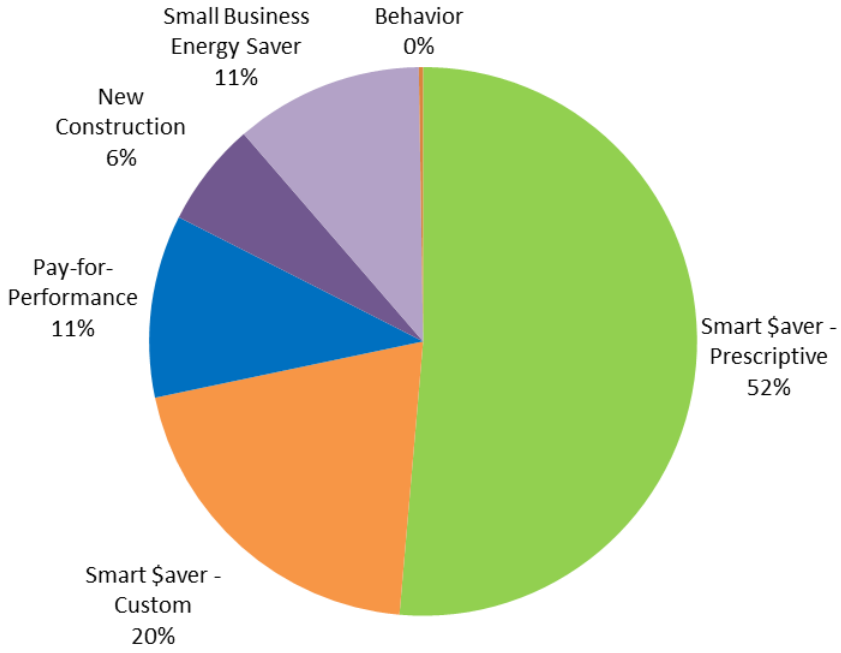


Figure 7-15: DEP Non-Residential 5-Yr Cumulative Potential by Program – Enhanced Scenario



Detailed program results for the DEP short-term non-residential EE programs are provided in Table 7-21:

Table 7-21: DEP Non-Residential Program Potential (cumulative through 2021)

	Prescriptive	Custom	Pay-for-Performance	New Construction	Small Business Energy Saver	Behavioral
5-yr (2021) impacts – Base scenario						
MWh savings (cumulative)	36,834	2,604	2,540	N/A	9,170	31
MW savings (cumulative)	6.4	0.3	0.5	N/A	1.9	0.0
Program costs (cumulative) ($M)	$6.63	$0.64	$0.30	N/A	$1.81	$0.01
Levelized Cost ($/kWh)	$0.039	$0.048	$0.043	N/A	$0.019	$0.049
5-yr (2021) impacts – Enhanced scenario						
MWh savings (cumulative)	41,162	16,287	8,627	4,943	8,893	203
MW savings (cumulative)	8.8	2.1	1.7	1.1	1.7	0.0
Program costs (cumulative) ($M)	$7.53	$2.36	$1.21	$0.77	$1.94	$0.06
Levelized Cost ($/kWh)	$0.041	$0.029	$0.039	$0.034	$0.023	$0.057

Table 7-22 provides the net benefits and benefit-to-cost ratios by sector for each scenario:

Table 7-22: Cost-Benefit Results – Non-Residential Programs (cumulative through 2021)

	Prescriptive	Custom	Pay-for-Performance	New Construction	Small Business Energy Saver	Behavioral
5-yr (2021) impacts – Base scenario						
TRC – Net Benefits($M)	$30.60	$0.88	$0.28	N/A	$8.21	$0.00
TRC – B/C ratio	3.26	1.75	1.52	N/A	5.46	1.54
UCT – Net Benefits ($M)	$37.50	$1.41	$0.52	N/A	$8.25	$0.00
UCT – B/C ratio	6.65	3.19	2.72	N/A	5.57	1.54
PCT – Net Benefits ($M)	$29.40	$0.82	$1.25	N/A	$0.00	$0.01
PCT – B/C ratio	3.41	1.78	4.00	N/A	1.00	N/A
RIM – Net Benefits ($M)	-$12.21	-$0.46	-$1.16	N/A	-$0.24	-$0.01
RIM – B/C ratio	0.78	0.82	0.41	N/A	0.98	0.62
5-yr (2021) impacts – Enhanced scenario						
TRC – Net Benefits($M)	$33.11	$9.08	$3.37	$3.35	$7.27	$0.17
TRC – B/C ratio	3.16	3.21	2.49	3.06	4.66	3.96
UCT – Net Benefits ($M)	$40.89	$10.83	$4.42	$4.20	$7.32	$0.17
UCT – B/C ratio	6.43	5.59	4.66	6.47	4.77	3.96
PCT – Net Benefits ($M)	$31.06	$7.66	$4.01	$2.59	-$0.27	$0.47

	Prescriptive	Custom	Pay-for-Performance	New Construction	Small Business Energy Saver	Behavioral
PCT – B/C ratio	3.25	3.15	3.05	2.84	0.97	N/A
RIM – Net Benefits ($M)	-$3.97	-$0.39	-$1.55	$0.20	-$0.61	-$0.30
RIM – B/C ratio	0.92	0.97	0.78	1.04	0.94	0.42

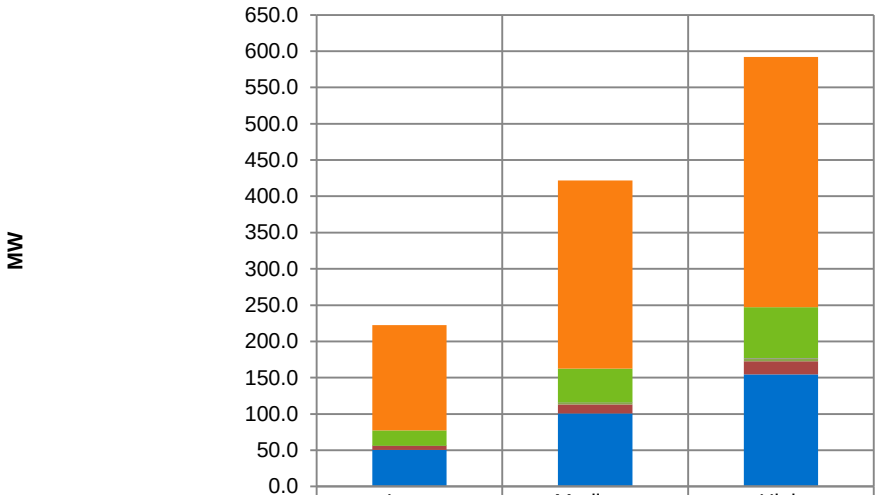
7.6 DEC Demand Response Program Potential

This section presents the estimated overall potential for the low, medium and high scenarios. The results are provided separately for summer and winter peaking capacity. The results are further broken down by customer segment and presented in the form of supply curves. All results presented reflect the projected achievable DR potential by 2041.

7.6.1 DEC Summer Peaking Capacity

Figure 7-16 presents the overall summer peak capacity results for each scenario, broken down by customer class. The capacity is what is expected to be available during the peak hour of system demand. Overall, the estimated magnitude of peak capacity ranges from 222 MW to 592 MW across the three scenarios considered, with the medium scenario estimating 421.8 MW by 2041. This equates to 11.4% of Duke South Carolina's peak load. The majority of this potential comes from the large C&I sector, with the bulk of the remaining capacity coming from residential customers. Variation in the peak capacity across the various scenarios can be attributed to differences in incentive levels, the degree of marketing, and technology cost forecasts.

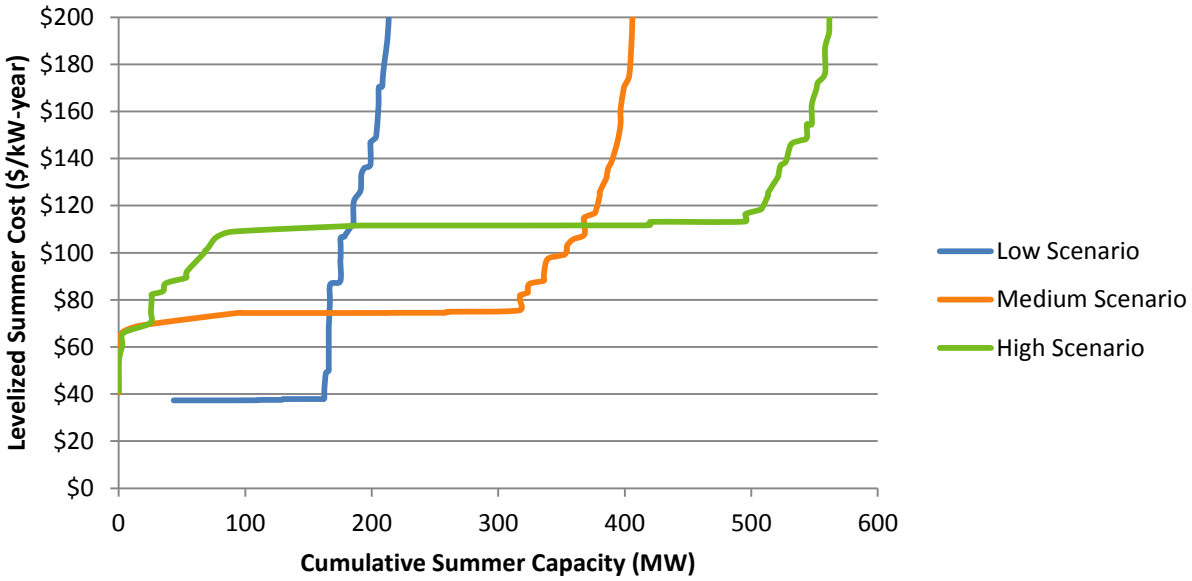
Figure 7-16 DEC DR Summer Peak Capacity Program Potential



	Low	Medium	High
Large C&I - 1 MW and Up	145.2	259.4	344.7
Large C&I - 500 kW to 1 MW	20.8	46.6	70.4
Large C&I - 300 kW to 500 kW	0.0	0.1	0.1
Small and Medium Business	0.1	2.8	4.1
Residential Multi-Family	5.8	12.0	18.0
Residential Single Family	50.5	100.9	154.6

Figure 7-17 shows the amount of summer peak capacity that can be attained based on levelized capacity costs. The supply curve is constructed by stacking all 155 granular customer segments starting with the least expensive resources. The supply cost curve is a useful metric because it allows DR resources to be compared with the full spectrum of resource options. Supply curves allow planners to rank different DR options and customer segments based on levelized costs, comparable resources, and the optimization of the resource mix. Because the low scenario has lower incentive levels, the initial DR resources are less costly but the potential is lower. In contrast, under the high scenario, initial resources cost more but the potential is higher.

Figure 7-17 DEC DR Summer Peak Capacity Supply Curve



Because the achievable potential is driven by marketing intensity, incentive levels, and technology costs, it is possible to yield non-linear changes in participation level. This can be seen in the program participation results in Table 7-23.

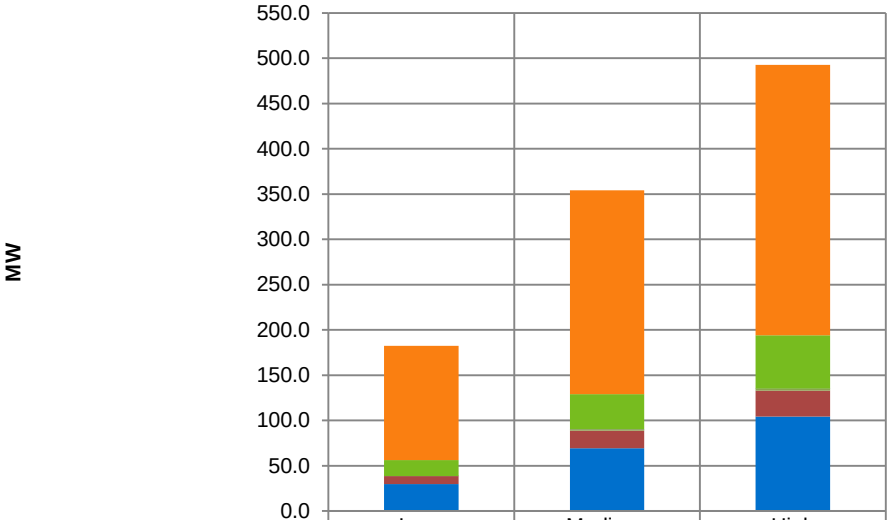
Table 7-23 DEC DR Program Participation Rates by Scenario and Customer Class

Customer Class	Low	Medium	High	Units
Residential Single Family	6.2%	11.8%	17.3%	% of Customers
Residential Multi-Family	5.5%	10.6%	15.9%	% of Customers
Small and Medium Business	1.2%	2.6%	3.8%	% of Customers
Large C&I - 300 kW to 500 kW	1.5%	3.7%	6.0%	% of Load
Large C&I - 500 kW to 1 MW	3.3%	7.5%	11.3%	% of Load
Large C&I - 1 MW and Up	12.6%	22.5%	29.9%	% of Load

7.6.2 DEC Winter Peaking Capacity

Figure 7-18 presents the overall winter peak capacity results for each scenario, broken down by customer class. The capacity is what is expected to be available during the peak hour of system demand. Overall, the estimated magnitude of peak capacity ranges from 182 MW to 493 MW across the three scenarios considered, with the medium scenario estimating 354.2 MW by 2041. This equates to 9.8% of Duke South Carolina's winter peak load. The majority of this peak comes from large C&I customers, with the bulk of the remaining capacity coming from residential customers. Variation in the peak capacity across the various scenarios can be attributed to differences in incentive levels, the degree of marketing, and technology cost forecasts.

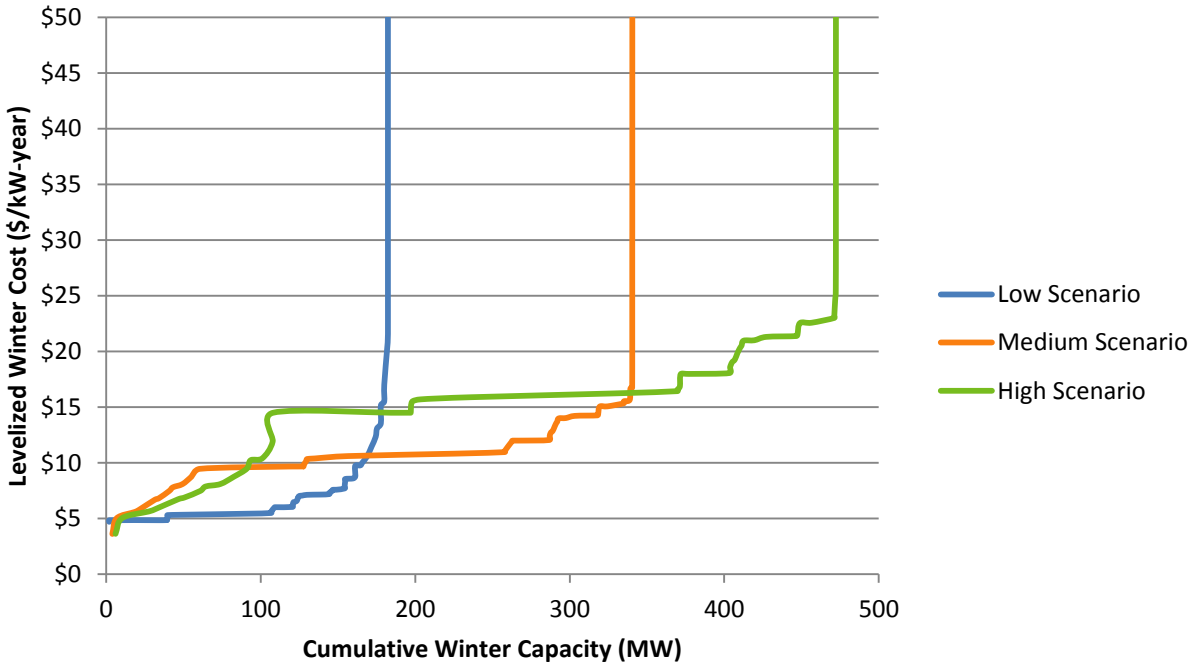
Figure 7-18 DEC DR Winter Peak Capacity Program Potential



	Low	Medium	High
Large C&I - 1 MW and Up	126.2	225.0	298.6
Large C&I - 500 kW to 1 MW	17.4	39.0	58.9
Large C&I - 300 kW to 500 kW	0.0	0.0	0.1
Small and Medium Business	0.0	1.4	2.0
Residential Multi-Family	9.1	19.2	28.6
Residential Single Family	29.6	69.5	104.4

Figure 7-19 shows the amount of winter peak capacity that can be attained based on levelized capacity costs. The supply curve is constructed by stacking all 155 granular customer segments starting with the least expensive resources.

Figure 7-19 DEC DR Winter Peak Capacity Supply Curve



7.6.3 Segment specific results

A total of 155 different customer segments were individually analyzed. This includes 30 segments each for residential single family and multi-family homes (60), 26 small and medium business industries, and 23 industry types for three distinct large commercial and industrial customer size categories (69). The section presents the segment-level results, focusing on the customer segments that are most attractive to pursue, allowing for prioritization and targeted marketing of those customer segments.

These results are fairly similar across the various scenarios that were studied, with only the absolute magnitude of the results changing. For the sake of simplicity, only the results for the base scenario are presented in this section.

Table 7-24 shows residential single family customer segments. Residential customers who rank in the top decile of consumption tend to provide the greatest benefit/cost ratio. This is not surprising since they tend to have the greatest load available for load reduction, making it possible to enroll significant capacity per marginal dollar spent on acquisition marketing, equipment, and installation costs.

Table 7-25 shows the residential multi-family customer segments, and Table 7-26 through Table 7-29 show the segment specific program potential results for each C&I customer class.

Table 7-24: DEC Residential Single Family Segment Specific Program Potential

	Single Family				Summer		Winter				
	Usage bin	# of accounts	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Net Benefit per Enrollee	Marginal Benefit Cost Ratio
RE	1	13,665	10.22%	$ -	-	$ -	-	$ -	$ -	$ -	-
	2	13,664	10.22%	$500,552	1.5	$1,325,801	3.7	$412,318	$1,237,567	$886	3.47
	3	13,667	9.17%	$452,693	1.8	$1,565,011	4.4	$489,746	$1,602,064	$1,278	4.54
	4	13,662	9.17%	$452,527	2.1	$1,785,402	5	$560,256	$1,893,131	$1,511	5.18
	5	13,665	9.17%	$452,627	2.4	$2,039,209	5.5	$615,569	$2,202,151	$1,757	5.87
	6	13,666	8.84%	$437,537	2.5	$2,158,007	5.7	$643,449	$2,363,919	$1,957	6.40
	7	13,660	8.84%	$437,345	2.8	$2,402,643	6.2	$695,467	$2,660,765	$2,204	7.08
	8	13,661	8.84%	$437,377	3.1	$2,684,088	6.7	$752,667	$2,999,378	$2,484	7.86
	9	13,669	11.69%	$567,852	4.8	$4,094,105	9.8	$1,093,531	$4,619,785	$2,891	9.14
	10	13,658	11.69%	$567,395	6	$5,208,927	11.7	$1,306,411	$5,947,944	$3,725	11.48
RS	1	21,113	13.67%	$ -	-	$ -	-	$ -	$ -	$ -	-
	2	21,111	13.67%	$1,016,213	3.6	$3,093,514	-	$ -	$2,077,301	$720	3.04
	3	21,125	9.99%	$757,485	3.8	$3,289,890	-	$ -	$2,532,405	$1,200	4.34
	4	21,095	9.99%	$756,410	4.6	$3,923,428	-	$ -	$3,167,019	$1,503	5.19
	5	21,107	9.99%	$756,840	5.1	$4,387,965	-	$ -	$3,631,125	$1,722	5.80
	6	21,115	14.16%	$1,050,990	8	$6,864,769	-	$ -	$5,813,779	$1,945	6.53
	7	21,112	14.16%	$1,050,841	8.6	$7,445,738	-	$ -	$6,394,897	$2,140	7.09
	8	21,113	14.16%	$1,050,890	9.4	$8,113,914	-	$ -	$7,063,023	$2,363	7.72
	9	21,101	15.27%	$1,129,046	11.3	$9,768,285	-	$ -	$8,639,240	$2,681	8.65
	10	21,110	15.27%	$1,129,527	14.5	$12,470,434	-	$ -	$11,340,906	$3,517	11.04
RT	1	26	13.67%	$1,252	0.0	$5,929	-	$ -	$4,677	$1,316	4.74
	2	26	13.67%	$1,252	0.0	$8,300	-	$ -	$7,048	$1,984	6.63
	3	26	9.99%	$932	0.0	$9,533	-	$ -	$8,601	$3,312	10.23
	4	26	9.99%	$932	0.0	$8,667	-	$ -	$7,734	$2,978	9.30
	5	25	9.99%	$896	0.0	$6,067	-	$ -	$5,170	$2,070	6.77
	6	26	14.16%	$1,294	0.0	$11,054	-	$ -	$9,760	$2,652	8.54
	7	26	14.16%	$1,294	0.0	$12,283	-	$ -	$10,989	$2,985	9.49
	8	26	14.16%	$1,294	0.0	$18,424	0.0	$160	$17,289	$4,697	14.36
	9	26	15.27%	$1,391	0.0	$23,854	-	$ -	$22,463	$5,656	17.15
	10	25	15.27%	$1,338	0.0	$25,179	0.0	$172	$24,014	$6,289	18.95
Total AC/Heating Program Potential					96.1		58.7				
Additional Potential from WH and PP					4.8		10.8				
Total Potential					**100.9**		**69.5**				

Table 7-25: DEC Residential Multi-Family Segment Specific Program Potential

	Multi - Family				Summer		Winter				
	Usage bin	# of accounts	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Net Benefit per Enrollee	Marginal Benefit Cost Ratio
RE	1	3671	9.85%	$ -	-	$ -	-	$ -	$ -	$ -	-
	2	3663	9.85%	$ -	-	$ -	-	$ -	$ -	$ -	-
	3	3667	11.31%	$ -	-	$ -	-	$ -	$ -	$ -	-
	4	3668	11.31%	$147,696	0.5	$402,301	1.0	$113,605	$368,210	$888	3.49
	5	3666	11.31%	$147,616	0.8	$658,399	1.7	$187,047	$697,831	$1,683	5.73
	6	3668	12.27%	$159,477	1.0	$895,386	2.4	$262,997	$998,906	$2,219	7.26
	7	3668	12.27%	$159,477	1.2	$1,032,728	2.7	$300,904	$1,174,155	$2,609	8.36
	8	3667	12.27%	$159,433	1.4	$1,205,204	3.2	$352,784	$1,398,554	$3,108	9.77
	9	3665	9.48%	$125,170	1.3	$1,099,536	2.9	$320,165	$1,294,531	$3,727	11.34
	10	3666	9.48%	$125,205	1.8	$1,570,766	4.0	$445,410	$1,890,972	$5,442	16.10
RS	1	1563	11.72%	$ -	-	$ -	-	$ -	$ -	$ -	-
	2	1560	11.72%	$ -	-	$ -	-	$ -	$ -	$ -	-
	3	1560	11.68%	$64,736	0.1	$112,466	-	$ -	$47,730	$262	1.74
	4	1562	11.68%	$64,819	0.3	$248,235	-	$ -	$183,417	$1,006	3.83
	5	1560	11.68%	$64,736	0.4	$372,859	-	$ -	$308,124	$1,691	5.76
	6	1560	7.88%	$44,931	0.4	$338,265	-	$ -	$293,334	$2,387	7.53
	7	1560	7.88%	$44,931	0.4	$370,383	-	$ -	$325,452	$2,649	8.24
	8	1561	7.88%	$44,960	0.5	$420,268	-	$ -	$375,309	$3,053	9.35
	9	1561	8.36%	$47,482	0.6	$485,260	-	$ -	$437,777	$3,355	10.22
	10	1560	8.36%	$47,452	0.6	$547,640	-	$ -	$500,188	$3,835	11.54
RT	1	0	11.72%	$ -	-	$ -	-	$ -	$ -	$ -	-
	2	0	11.72%	$ -	-	$ -	-	$ -	$ -	$ -	-
	3	0	11.68%	$ -	-	$ -	-	$ -	$ -	$ -	-
	4	0	11.68%	$ -	-	$ -	-	$ -	$ -	$ -	-
	5	0	11.68%	$ -	-	$ -	-	$ -	$ -	$ -	-
	6	0	7.88%	$ -	-	$ -	-	$ -	$ -	$ -	-
	7	0	7.88%	$ -	-	$ -	-	$ -	$ -	$ -	-
	8	0	7.88%	$ -	-	$ -	-	$ -	$ -	$ -	-
	9	0	8.36%	$ -	-	$ -	-	$ -	$ -	$ -	-
	10	0	8.36%	$ -	-	$ -	-	$ -	$ -	$ -	-
Total AC/Heating Program Potential					11.3		17.7				
Additional Potential from WH and PP					0.7		1.5				
Total Potential					**12.0**		**19.2**				

Table 7-26: DEC SMB Segment Specific Program Potential

SMB				Summer		Winter				
Segment	# of Accounts	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Net Benefit per Enrollee	Marginal Benefit Cost Ratio
Assembly	5,639	0.42%	$128,449	0.1	$70,263	0.0	$5,190	($52,995)	($2,254)	0.59
Colleges & Universities	482	0.42%	$10,776	0.0	$3,908	0.0	$230	($6,638)	($3,303)	0.38
Data Centers	130	2.70%	$4,832	0.0	$9,378	0.0	$670	$5,216	$1,485	2.08
Grocery	989	5.59%	$56,998	0.2	$169,203	0.0	$2,961	$115,166	$2,084	3.02
Healthcare	1,920	0.47%	$44,533	0.0	$27,938	0.0	$1,927	($14,667)	($1,613)	0.67
Hospitals	111	0.42%	$2,591	0.0	$2,026	0.0	$174	($391)	($844)	0.85
Institutional	3,783	0.42%	$84,564	0.0	$30,536	0.0	$2,365	($51,663)	($3,275)	0.39
Lodging (Hospitality)	460	0.47%	$10,558	0.0	$4,478	0.0	$721	($5,359)	($2,460)	0.49
Miscellaneous	10,010	0.45%	$ -	-	$ -	-	$ -	$ -	$ -	-
Office	12,738	0.47%	$283,752	0.1	$64,546	0.1	$6,460	($212,746)	($3,527)	0.25
Restaurants	2,170	0.47%	$52,609	0.1	$55,096	0.0	$0	$2,488	$242	1.05
Retail	27,688	5.59%	$1,311,857	2.1	$1,804,993	1	$115,163	$608,299	$393	1.46
Schools K-12	1,342	0.29%	$29,056	0	$7,958	0	$986	($20,113)	($5,245)	0.31
Warehouse	2,269	2.70%	$73,444	0.1	$51,108	0.1	$6,580	($15,756)	($257)	0.79
Agriculture & Forestry	2,100	2.88%	$71,271	0.1	$66,932	0.0	$3,343	($997)	($16)	0.99
Chemicals & Plastics	274	1.49%	$8,106	0.0	$11,239	0.0	$1,259	$4,391	$1,076	1.54
Construction	188	2.88%	$ -	-	$ -	-	$ -	$ -	$ -	-
Electrical & Electronic Equipment	98	1.49%	$2,848	0.0	$3,488	0.0	$50	$690	$473	1.24
Lumber, Furniture, Pulp & Paper	269	1.49%	$7,553	0.0	$6,847	0.0	$520	($186)	($46)	0.98
Metal Products & Machinery	487	1.49%	$14,312	0.0	$18,989	0.0	$1,259	$5,936	$819	1.41
Misc. Manufacturing	712	1.49%	$ -	-	$ -	-	$ -	$ -	$ -	-
Primary Resource Industries	513	2.88%	$ -	-	$ -	-	$ -	$ -	$ -	-
Stone, Clay, Glass & Concrete	86	1.49%	$2,515	0.0	$2,713	0.0	$420	$617	$482	1.25
Textiles & Leather	144	1.49%	$4,201	0.0	$5,296	0.0	$386	$1,481	$691	1.35
Transportation Equipment	86	2.70%	$2,937	0.0	$2,344	0.0	$457	($135)	($58)	0.95
Water & Wastewater	1,171	2.70%	$ -	-	$ -	-	$ -	$ -	$ -	-
Total				2.8		1.4				

Table 7-27: DEC Large C&I (300-500 kW) Segment Specific Program Potential

Large C&I - 300 kW to 500 kW				Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Enrolled MW
Agriculture & Forestry	-	7.20%	$ -	-	$ -	-	$ -	$ -	$ -
Chemicals & Plastics	-	3.72%	$ -	-	$ -	-	$ -	$ -	$ -
Colleges & Universities	-	1.04%	$ -	-	$ -	-	$ -	$ -	$ -
Data Centers	-	6.76%	$ -	-	$ -	-	$ -	$ -	$ -
Electrical & Electronic Equipment	-	3.72%	$ -	-	$ -	-	$ -	$ -	$ -
Grocery stores / Convenience chains	-	13.97%	$ -	-	$ -	-	$ -	$ -	$ -
Healthcare	-	1.18%	$ -	-	$ -	-	$ -	$ -	$ -
Hospitals	-	1.04%	$ -	-	$ -	-	$ -	$ -	$ -
Institutional	-	1.04%	$ -	-	$ -	-	$ -	$ -	$ -
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	1.04%	$ -	-	$ -	-	$ -	$ -	$ -
Lodging (Hospitality)	-	1.18%	$ -	-	$ -	-	$ -	$ -	$ -
Lumber, Furniture, Pulp & Paper	-	3.72%	$ -	-	$ -	-	$ -	$ -	$ -
Metal Products & Machinery	2.2	3.72%	$6,904	0.08	$70,520	0.04	$4,998	$68,614	$837,913
Misc. Manufacturing	-	3.72%	$ -	-	$ -	-	$ -	$ -	$ -
Retail	-	13.97%	$ -	-	$ -	-	$ -	$ -	$ -
Miscellaneous	-	1.14%	$ -	-	$ -	-	$ -	$ -	$ -
Primary Resource Industries	-	7.20%	$ -	-	$ -	-	$ -	$ -	$ -
Schools K-12	-	0.71%	$ -	-	$ -	-	$ -	$ -	$ -
Stone, Clay, Glass & Concrete	-	3.72%	$ -	-	$ -	-	$ -	$ -	$ -
Textiles & Leather	-	3.72%	$ -	-	$ -	-	$ -	$ -	$ -
Transportation Equipment	-	6.76%	$ -	-	$ -	-	$ -	$ -	$ -
Warehouse	-	6.76%	$ -	-	$ -	-	$ -	$ -	$ -
Water & Wastewater	-	6.76%	$ -	-	$ -	-	$ -	$ -	$ -
Total				**0.1**		**0.0**			

Table 7-28: DEC Large C&I (500 kW – 1 MW) Segment Specific Program Potential

Large C&I - 500 kW to 1 MW				Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Enrolled MW
Agriculture & Forestry	-	10.32%	$ -	-	$ -	-	$ -	$ -	$ -
Chemicals & Plastics	304.4	7.73%	$1,980,635	23.5	$20,264,058	21.5	$2,403,082	$20,686,504	$879,140
Colleges & Universities	36.8	2.75%	$85,494	1.0	$872,272	0.8	$86,550	$873,328	$862,229
Data Centers	-	7.89%	$ -	-	$ -	-	$ -	$ -	$ -
Electrical & Electronic Equipment	86.9	7.73%	$565,431	6.7	$5,784,976	4.6	$519,024	$5,738,569	$854,278
Grocery stores / Convenience chains	-	13.97%	$ -	-	$ -	-	$ -	$ -	$ -
Healthcare	21.7	3.23%	$59,171	0.7	$604,092	0.5	$52,814	$597,735	$852,125
Hospitals	3.2	2.75%	$7,434	0.1	$75,850	0.1	$6,160	$74,576	$846,720
Institutional	1.9	2.75%	$4,414	0.1	$45,036	0.0	$3,388	$44,010	$841,567
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	2.75%	$ -	-	$ -	-	$ -	$ -	$ -
Lodging (Hospitality)	0.8	3.23%	$2,181	0.0	$22,271	0.0	$2,532	$22,621	$874,751
Lumber, Furniture, Pulp & Paper	0.4	7.73%	$2,603	0.0	$26,628	0.0	$1,730	$25,756	$832,966
Metal Products & Machinery	1.1	7.73%	$7,157	0.1	$73,228	0.0	$1,730	$67,800	$797,360
Misc. Manufacturing	1.8	7.73%	$11,712	0.1	$86,542	0.1	$15,571	$90,400	$649,700
Retail	9.4	13.97%	$110,455	1.3	$1,130,851	0.9	$101,612	$1,122,008	$854,453
Miscellaneous	0.5	0.78%	$333	0.0	$2,019	0.0	$437	$2,123	$543,294
Primary Resource Industries	33.2	10.32%	$288,178	2.6	$2,256,554	3.4	$383,270	$2,351,646	$686,624
Schools K-12	0.6	1.58%	$801	0.0	$8,151	0.0	$353	$7,703	$813,811
Stone, Clay, Glass & Concrete	21	7.73%	$136,640	1.6	$1,397,980	1.2	$136,676	$1,398,016	$861,209
Textiles & Leather	0.9	7.73%	$5,856	0.1	$53,256	0.1	$7,785	$55,186	$793,231
Transportation Equipment	98.7	7.89%	$655,193	7.8	$6,703,540	5.0	$559,540	$6,607,887	$848,899
Warehouse	3.2	7.89%	$21,242	0.3	$217,339	0.2	$22,064	$218,160	$864,442
Water & Wastewater	7.8	7.89%	$51,778	0.6	$529,763	0.6	$64,426	$542,411	$881,748
Total				**47**		**39**			

Table 7-29: DEC Large C&I (≥1 MW) Segment Specific Program Potential

Large C&I – 1 MW and Up				Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Enrolled MW
Agriculture & Forestry	-	16.63%	$ -	-	$ -	-	$ -	$ -	$ -
Chemicals & Plastics	310.9	24.66%	$6,447,505	76.7	$66,034,681	68.5	$7,667,224	$67,254,401	$877,094
Colleges & Universities	41.3	20.20%	$701,715	8.3	$7,186,123	5.7	$635,339	$7,119,748	$853,232
Data Centers	-	16.63%	$ -	-	$ -	-	$ -	$ -	$ -
Electrical & Electronic Equipment	89	24.66%	$1,835,330	21.8	$18,797,264	14.8	$1,655,988	$18,617,921	$852,970
Grocery stores / Convenience chains	0	9.55%	$ -	-	$ -	-	$ -	$ -	$ -
Healthcare	23	6.94%	$132,571	1.6	$1,356,103	1	$113,338	$1,336,870	$848,973
Hospitals	3.4	20.20%	$57,768	0.7	$591,594	0.4	$45,220	$579,045	$842,920
Institutional	2	20.20%	$32,282	0.4	$330,596	0.2	$24,871	$323,185	$841,881
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	20.20%	$ -	-	$ -	-	$ -	$ -	$ -
Lodging (Hospitality)	-	6.94%	$ -	-	$ -	-	$ -	$ -	$ -
Lumber, Furniture, Pulp & Paper	234	24.66%	$4,856,885	56.9	$49,000,325	57.8	$6,463,873	$50,607,313	$876,138
Metal Products & Machinery	101	24.66%	$2,100,779	25	$21,515,964	20.1	$2,243,864	$21,659,049	$866,914
Misc. Manufacturing	1	24.66%	$16,591	0.2	$169,919	0.2	$22,080	$175,408	$889,008
Retail	9	9.55%	$73,944	0.9	$756,750	0.6	$69,476	$752,281	$856,102
Miscellaneous	28.6	5.49%	$132,229	1.6	$1,352,002	1.1	$125,313	$1,345,086	$856,781
Primary Resource Industries	33.2	16.63%	$464,420	4.1	$3,566,575	5.5	$617,938	$3,720,093	$673,691
Schools K-12	0.7	12.00%	$7,070	0.1	$72,369	0.0	$2,687	$67,986	$809,032
Stone, Clay, Glass & Concrete	19.6	24.66%	$406,469	4.8	$4,163,010	3.9	$436,077	$4,192,618	$867,312
Textiles & Leather	151.7	24.66%	$3,145,984	37.4	$32,220,846	33	$3,692,853	$32,767,715	$875,803
Transportation Equipment	100.6	16.63%	$1,407,248	16.7	$14,409,535	10.5	$1,180,038	$14,182,324	$847,608
Warehouse	3.1	16.63%	$43,365	0.5	$444,031	0.4	$46,531	$447,198	$867,329
Water & Wastewater	10	16.63%	$139,885	1.7	$1,432,359	1.2	$135,872	$1,428,346	$858,774
Total				**259**		**225**			

7.6.4 Key Findings

The overall DR potential is estimated to be 422 MW of peak capacity in the base scenario, and is as high as 592 MW under the assumption of aggressive marketing strategies and substantial reductions in technology costs. These estimates are based on an in-depth, bottom-up assessment of load reduction potential of all customer segments, and includes an analysis of

program-based DR.

The extent to whether these potential figures can be attained in a cost-effective manner by 2041 depends on the ability to implement programs that target all possible end-uses and cost-effective customer segments. These predictions also rely upon certain assumptions around the future value of capacity, as well as technology cost reductions.

The customer segment-level analysis of the program-based DR potential sheds light on which customer segments can provide the greatest magnitude of capacity, as well as which customer segments are most cost-effective to pursue. Unsurprisingly, the most attractive customer segments from a benefit/cost perspective are customers who have more load available for reduction during peak hours: larger residential customers who live in single-family homes, as well as large C&I customers, particularly customers in manufacturing industries. In general, these customers are more capable of shifting load with little inconvenience/cost, and therefore tend to have higher participation levels in DR programs as well as greater willingness to shed a higher percentage of their load.

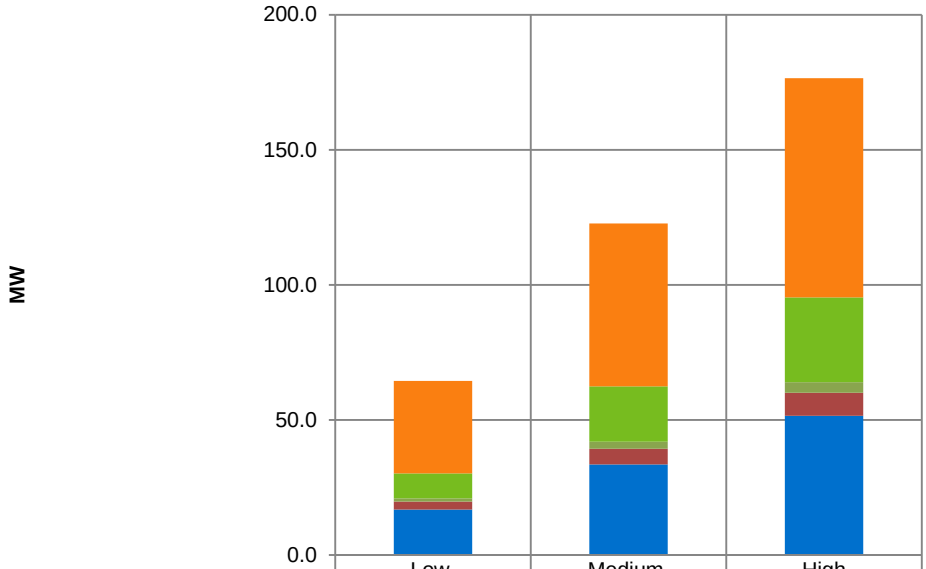
7.7 DEP Demand Response Program Potential

This section presents the estimated overall potential for the low, medium and high scenarios. The results are provided separately for summer and winter peaking capacity. The results are further broken down by customer segment and presented in the form of supply curves. All results presented reflect the projected achievable DR potential by 2041.

7.7.1 DEP Summer Peaking Capacity

Figure 7-20 presents the overall summer peak capacity results for each scenario, broken down by customer class. The capacity is what is expected to be available during the peak hour of system demand. Overall, the estimated magnitude of peak capacity ranges from 64 MW to 177 MW across the three scenarios considered, with the medium scenario estimating 122.7 MW by 2041. This equates to approximately 2.6% of Duke Progress' peak load in South Carolina. More than half of this potential comes from the large C&I sector, with the bulk of the remainder coming from residential customers. Variation in the peak capacity across the various scenarios can be attributed to differences in incentive levels, the degree of marketing, and technology cost forecasts.

Figure 7-20 DEP DR Summer Peak Capacity Program Potential

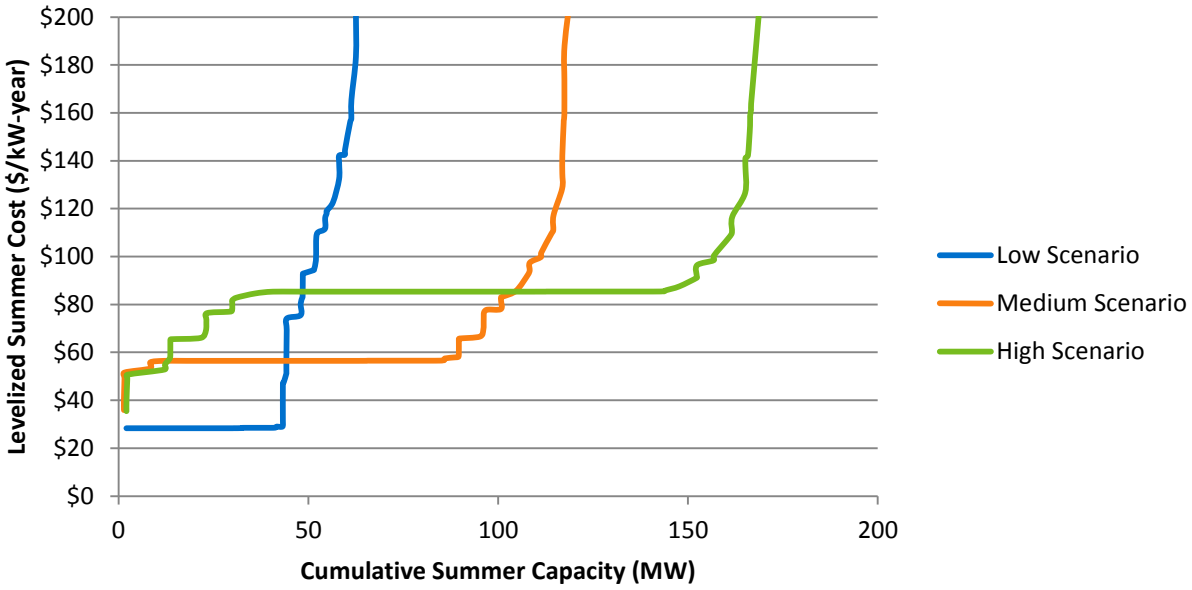


	Low	Medium	High
Large C&I - 1 MW and Up	34.2	60.4	81.2
Large C&I - 500 kW to 1 MW	9.3	20.5	31.3
Large C&I - 300 kW to 500 kW	0.0	0.0	0.0
Small and Medium Business	1.1	2.6	3.9
Residential Multi-Family	3.0	5.8	8.5
Residential Single Family	16.8	33.5	51.5

Figure 7-21 shows the amount of summer peak capacity that can be attained based on levelized capacity costs. The supply curve is constructed by stacking all 135 granular customer segments starting with the least expensive resources. The supply cost curve is a useful metric because it allows DR resources to be compared with the full spectrum of resource options. Supply curves

allow planners to rank different DR options and customer segments based on levelized costs, comparable resources, and the optimization of the resource mix. Because the low scenario has lower incentive levels, the initial DR resources are less costly but the potential is lower. In contrast, under the high scenario, initial resources cost more but the potential is higher.

Figure 7-21 DEP DR Summer Peak Capacity Supply Curve



Because the achievable potential is driven by marketing intensity, incentive levels, and technology costs, it is possible to yield non-linear changes in participation level. This can be seen in the program participation results in Table 7-30 DEP DR Program Participation Rates by Scenario and Customer Class.

Table 7-30 DEP DR Program Participation Rates by Scenario and Customer Class

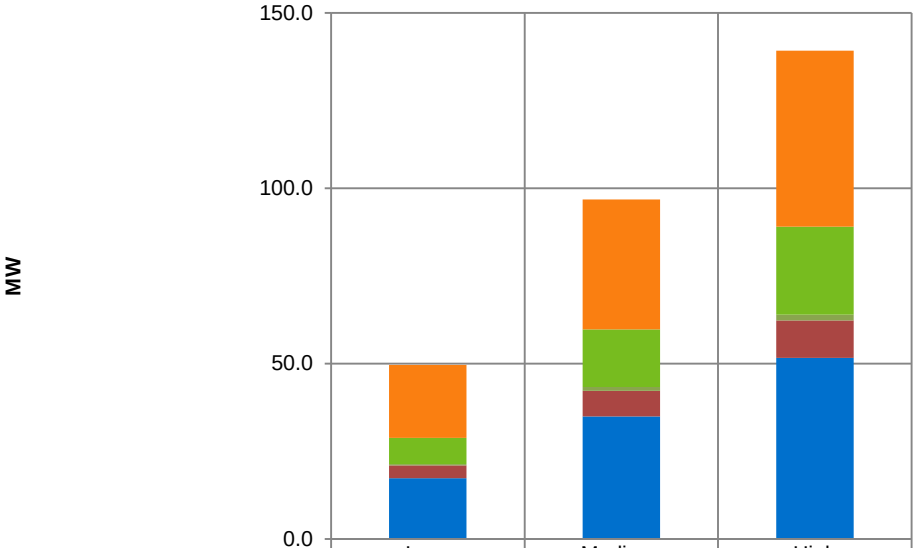
Customer Class	Low	Medium	High	Units
Residential Single Family	6.2%	11.7%	17.3%	% of Customers
Residential Multi-Family	6.9%	12.9%	18.9%	% of Customers
Small and Medium Business	1.2%	2.5%	3.7%	% of Customers
Large C&I - 300 kW to 500 kW	N/A	N/A	N/A	% of Load
Large C&I - 500 kW to 1 MW	3.0%	6.6%	10.1%	% of Load
Large C&I - 1 MW and Up	11.7%	20.6%	27.7%	% of Load

7.7.2 DEP Winter Peaking Capacity

Table 7-22 presents the overall winter peak capacity results for each scenario, broken down by customer class. The capacity is what is expected to be available during the peak hour of system demand. Overall, the estimated magnitude of peak capacity ranges from 50 MW to 139 MW

across the three scenarios considered, with the medium scenario estimating 96.8 MW by 2041. This equates to approximately 2.1% of DEP winter peak load in South Carolina. The potential is about evenly split between the residential and large C&I sectors, with a small contribution from SMB customers. Variation in the peak capacity across the various scenarios can be attributed to differences in incentive levels, the degree of marketing, and technology cost forecasts.

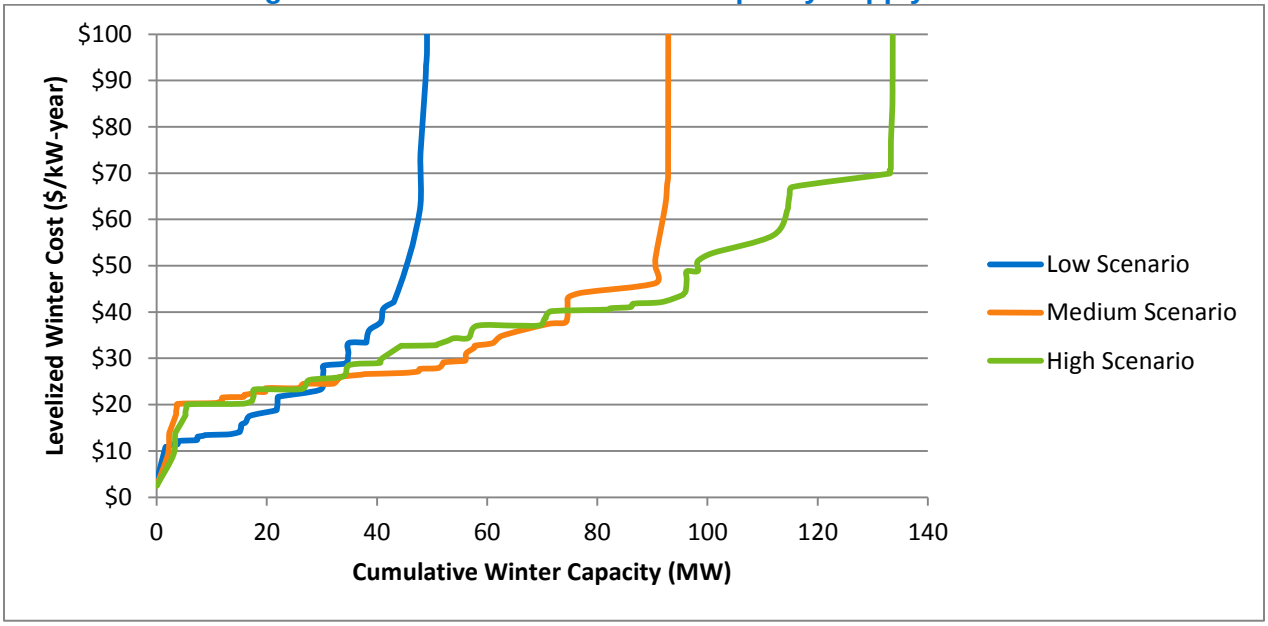
Figure 7-22 DEP DR Winter Peak Capacity Program Potential



	Low	Medium	High
Large C&I - 1 MW and Up	20.9	37.1	50.1
Large C&I - 500 kW to 1 MW	7.5	16.4	25.1
Large C&I - 300 kW to 500 kW	0.0	0.0	0.0
Small and Medium Business	0.3	1.1	1.6
Residential Multi-Family	3.7	7.3	10.7
Residential Single Family	17.3	35.0	51.7

Table 7-23 shows the amount of peak capacity that can be attained based on levelized capacity costs. The supply curve is constructed by stacking all 135 granular customer segments starting with the least expensive resources.

Figure 7-23 DEP DR Winter Peak Capacity Supply Curve



7.7.3 Segment specific results

A total of 135 different customer segments were individually analyzed. This includes 10 different consumption deciles each for two different rate schedules for residential single family and multi-family homes (40), 26 different industries of small and medium businesses, and 23 industry types for three distinct large commercial and industrial customer size categories (69). The section presents the segment-level results, focusing on the customer segments that are most attractive to pursue, allowing for prioritization and targeted marketing of those customer segments.

These results are fairly similar across the various scenarios that were studied, with only the absolute magnitude of the results changing. For the sake of simplicity, only the results for the base scenario are presented in this section.

Table 7-31 shows residential single family customer segments. Residential customers who rank in the top decile of consumption tend to provide the greatest benefit/cost ratio. This is not surprising since they tend to have the greatest load available for load reduction, making it possible to enroll significant capacity per marginal dollar spent on acquisition marketing, equipment, and installation costs.

shows the residential multi-family customer segments, and Table 7-33 through Table 7-36 show the segment specific program potential results for each C&I customer class.

Table 7-31: DEP Residential Single Family Segment Specific Program Potential

	Single Family				Summer		Winter				
	Usage bin	# of accounts	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Net Benefit per Enrollee	Marginal Benefit Cost Ratio
RES	1	10,759	12.12%	$0	-	$ -	-	$ -	$ -	$ -	-
	2	10,755	12.12%	$444,924	1.0	$656,626	0.7	$179,560	$391,262	$300	1.88
	3	10,757	10.93%	$403,919	2.3	$1,449,892	1.8	$433,251	$1,479,225	$1,259	4.66
	4	10,757	10.93%	$403,919	2.7	$1,700,530	2.5	$618,163	$1,914,774	$1,629	5.74
	5	10,757	10.93%	$403,919	2.9	$1,865,571	3.0	$726,054	$2,187,706	$1,861	6.42
	6	10,754	10.55%	$390,802	3.1	$1,947,958	3.3	$793,879	$2,351,035	$2,072	7.02
	7	10,759	10.55%	$390,983	3.3	$2,099,513	3.7	$898,751	$2,607,281	$2,297	7.67
	8	10,754	10.55%	$390,802	3.6	$2,307,695	4.1	$998,695	$2,915,588	$2,570	8.46
	9	10,757	13.77%	$502,087	5.5	$3,474,854	5.9	$1,441,679	$4,414,446	$2,980	9.79
	10	10,756	13.77%	$502,040	6.8	$4,341,245	6.8	$1,669,460	$5,508,665	$3,719	11.97
R-TOU	1	178	15.97%	$9,565	0.0	$13,490	0.0	$7,151	$11,076	$390	2.16
	2	178	15.97%	$9,565	0.1	$37,604	0.1	$21,646	$49,684	$1,748	6.19
	3	178	11.85%	$7,214	0.1	$32,731	0.1	$20,718	$46,236	$2,191	7.41
	4	178	11.85%	$7,214	0.1	$34,100	0.1	$23,193	$50,079	$2,373	7.94
	5	178	11.85%	$7,214	0.1	$40,798	0.1	$22,653	$56,237	$2,665	8.80
	6	177	16.52%	$9,820	0.1	$58,999	0.1	$32,959	$82,137	$2,810	9.36
	7	178	16.52%	$9,876	0.1	$61,621	0.1	$34,394	$86,139	$2,930	9.72
	8	178	16.52%	$9,876	0.1	$69,183	0.1	$30,174	$89,481	$3,044	10.06
	9	178	17.75%	$10,581	0.1	$82,639	0.2	$49,568	$121,626	$3,849	12.49
	10	177	17.75%	$10,522	0.2	$98,531	0.2	$52,403	$140,413	$4,469	14.35
Total AC/Heating Program Potential					32.0		33.0				
Additional Potential from WH and PP					1.5		2.0				
Total Potential					**33.5**		**35.0**				

Table 7-32: DEP Residential Multi-Family Segment Specific Program Potential

	Multi-Family				Summer		Winter				
	Usage bin	# of accounts	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Net Benefit per Enrollee	Marginal Benefit Cost Ratio
RES	1	1765	11.69%	$ -	-	$ -	-	$ -	$ -	$ -	-
	2	1764	11.69%	$ -	-	$ -	-	$ -	$ -	$ -	-
	3	1764	13.34%	$ -	-	$ -	-	$ -	$ -	$ -	-
	4	1766	13.34%	$79,978	0.4	$236,337	0.3	$80,052	$236,411	$1,004	3.96
	5	1764	13.34%	$79,888	0.5	$331,581	0.6	$139,004	$390,697	$1,660	5.89
	6	1765	14.42%	$86,031	0.7	$475,300	0.8	$202,424	$591,692	$2,326	7.88
	7	1763	14.42%	$85,934	0.8	$508,929	0.9	$228,126	$651,122	$2,562	8.58
	8	1764	14.42%	$85,982	0.9	$570,211	1.1	$279,750	$763,979	$3,004	9.89
	9	1764	11.28%	$68,201	0.8	$541,178	1.1	$258,531	$731,508	$3,678	11.73
	10	1764	11.28%	$68,201	1.4	$875,762	2.0	$496,136	$1,303,697	$6,556	20.12
R-TOU	1	3	13.81%	$140	0.0	$987	0.0	$514	$1,361	$3,285	10.69
	2	2	13.81%	$94	-	$ -	0.0	$2,536	$2,443	$8,846	27.10
	3	2	13.76%	$ -	-	$ -	-	$ -	$ -	$ -	-
	4	3	13.76%	$140	0.0	$453	0.0	$100	$413	$1,001	3.95
	5	2	13.76%	$93	0.0	$1,182	0.0	$18	$1,107	$4,025	12.88
	6	2	9.45%	$66	0.0	$542	0.0	$34	$510	$2,697	8.77
	7	3	9.45%	$98	0.0	$116	0.0	$134	$152	$535	2.54
	8	2	9.45%	$66	0.0	$586	0.0	$62	$583	$3,083	9.88
	9	2	10.00%	$69	0.0	$384	0.0	$90	$405	$2,025	6.86
	10	2	10.00%	$69	0.0	$791	0.0	$51	$773	$3,866	12.18
Total AC/Heating Program Potential					5.6		6.9				
Additional Potential from WH and PP					0.3		0.4				
Total Potential					**5.8**		**7.3**				

Table 7-33: DEP SMB Segment Specific Program Potential

SMB				Summer		Winter				
Segment	# of Accounts	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Net Benefit per Enrollee	Marginal Benefit Cost Ratio
Assembly	2313	0.37%	$61,083	0.1	$57,959	0.1	$36,493	$33,369	$3,874	1.55
Colleges & Universities	133	0.37%	$3,277	0.0	$3,540	-	$ -	$263	$531	1.08
Data Centers	17	2.49%	$577	0.0	$639	0.0	$184	$245	$580	1.42
Grocery	728	5.22%	$41,991	0.0	$9,052	0.2	$41,233	$8,294	$218	1.20
Healthcare	774	0.42%	$19,443	0.0	$22,424	0.0	$2,930	$5,911	$1,802	1.30
Hospitals	72	0.37%	$1,963	0.0	$1,890	0.0	$1,329	$1,256	$4,684	1.64
Institutional	4856	0.37%	$108,341	0.1	$36,120	0.1	$13,664	($58,557)	($3,238)	0.46
Lodging (Hospitality)	283	0.42%	$6,996	0.0	$3,102	0.0	$2,784	($1,109)	($925)	0.84
Miscellaneous	790	0.41%	$17,479	0.0	$1,722	0.0	$1,470	($14,287)	($4,451)	0.18
Office	3379	0.42%	$77,148	0.1	$34,235	0.1	$12,908	($30,006)	($2,096)	0.61
Restaurants	967	0.42%	$24,699	0.0	$31,377	-	$ -	$6,678	$1,630	1.27
Retail	10833	5.22%	$580,150	1.9	$1,233,459	0.5	$116,376	$769,685	$1,361	2.33
Schools K-12	889	0.25%	$19,302	0.0	$5,510	0.0	$119	($13,673)	($6,059)	0.29
Warehouse	738	2.49%	$23,095	0.0	$11,504	0.0	$3,857	($7,734)	($421)	0.67
Agriculture & Forestry	800	2.65%	$37,039	0.2	$107,191	-	$ -	$70,152	$3,305	2.89
Chemicals & Plastics	70	1.36%	$2,595	0.0	$6,882	-	$ -	$4,288	$4,516	2.65
Construction	2	2.65%	$412	0.0	$2,897	-	$ -	$2,485	$46,831	7.03
Electrical & Electronic Equipment	19	1.36%	$594	0.0	$523	0.0	$367	$296	$1,149	1.50
Lumber, Furniture, Pulp & Paper	125	1.36%	$0	-	$ -	-	$ -	$ -	$ -	-
Metal Products & Machinery	158	1.36%	$6,795	0.0	$23,260	-	$ -	$16,465	$7,683	3.42
Misc. Manufacturing	341	1.36%	$0	-	$ -	-	$ -	$ -	$ -	-
Primary Resource Industries	102	2.65%	$8,878	0.0	$2,727	0.1	$18,347	$12,195	$4,506	2.37
Stone, Clay, Glass & Concrete	42	1.36%	$1,193	0.0	$348	0.0	$434	($410)	($721)	0.66
Textiles & Leather	145	1.36%	$0	-	$ -	-	$ -	$ -	$ -	-
Transportation Equipment	19	2.49%	$869	0.0	$2,557	0.0	$61	$1,749	$3,699	3.01
Water & Wastewater	801	2.49%	$30,478	0.1	$57,042	0.0	$4,836	$31,401	$1,576	2.03
Total				**2.6**		**1.1**				

Table 7-34: DEP Large C&I (300-500 kW) Segment Specific Program Potential

Large C&I - 300 kW to 500 kW				Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Enrolled MW
Agriculture & Forestry	-	6.63%	$ -	-	$ -	-	$ -	$ -	$ -
Chemicals & Plastics	-	3.39%	$ -	-	$ -	-	$ -	$ -	$ -
Colleges & Universities	-	0.93%	$ -	-	$ -	-	$ -	$ -	$ -
Data Centers	-	6.22%	$ -	-	$ -	-	$ -	$ -	$ -
Electrical & Electronic Equipment	-	3.39%	$ -	-	$ -	-	$ -	$ -	$ -
Grocery stores / Convenience chains	-	13.05%	$ -	-	$ -	-	$ -	$ -	$ -
Healthcare	-	1.06%	$ -	-	$ -	-	$ -	$ -	$ -
Hospitals	-	0.93%	$ -	-	$ -	-	$ -	$ -	$ -
Institutional	-	0.93%	$ -	-	$ -	-	$ -	$ -	$ -
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	0.93%	$ -	-	$ -	-	$ -	$ -	$ -
Lodging (Hospitality)	-	1.06%	$ -	-	$ -	-	$ -	$ -	$ -
Lumber, Furniture, Pulp & Paper	-	3.39%	$ -	-	$ -	-	$ -	$ -	$ -
Metal Products & Machinery	-	3.39%	$ -	-	$ -	-	$ -	$ -	$ -
Misc. Manufacturing	-	3.39%	$ -	-	$ -	-	$ -	$ -	$ -
Retail	-	13.05%	$ -	-	$ -	-	$ -	$ -	$ -
Miscellaneous	-	1.02%	$ -	-	$ -	-	$ -	$ -	$ -
Primary Resource Industries	-	6.63%	$ -	-	$ -	-	$ -	$ -	$ -
Schools K-12	-	0.63%	$ -	-	$ -	-	$ -	$ -	$ -
Stone, Clay, Glass & Concrete	-	3.39%	$ -	-	$ -	-	$ -	$ -	$ -
Textiles & Leather	-	3.39%	$ -	-	$ -	-	$ -	$ -	$ -
Transportation Equipment	-	6.22%	$ -	-	$ -	-	$ -	$ -	$ -
Warehouse	-	6.22%	$ -	-	$ -	-	$ -	$ -	$ -
Water & Wastewater	-	6.22%	$ -	-	$ -	-	$ -	$ -	$ -
Total				**0.0**		**0.0**			

Table 7-35: DEP Large C&I (500 kW – 1 MW) Segment Specific Program Potential

Large C&I - 500 kW to 1 MW				Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Enrolled MW
Agriculture & Forestry	-	9.58%	$ -	-	$ -	-	$ -	$ -	$ -
Chemicals & Plastics	12.5	7.14%	$69,733	0.9	$568,580	0.8	$207,381	$706,227	$791,815
Colleges & Universities	-	2.49%	$ -	-	$ -	-	$ -	$ -	$ -
Data Centers	-	7.28%	$ -	-	$ -	-	$ -	$ -	$ -
Electrical & Electronic Equipment	15.5	7.14%	$86,469	1.1	$705,039	1.0	$238,750	$857,319	$775,175
Grocery stores / Convenience chains	-	13.05%	$ -	-	$ -	-	$ -	$ -	$ -
Healthcare	12.0	2.94%	$27,635	0.4	$224,750	0.3	$67,451	$264,566	$750,420
Hospitals	2.3	2.49%	$4,501	0.1	$36,581	0.0	$7,312	$39,392	$686,468
Institutional	10.6	2.49%	$20,746	0.3	$168,593	0.2	$48,140	$195,986	$741,066
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	2.49%	$ -	-	$ -	-	$ -	$ -	$ -
Lodging (Hospitality)	-	2.94%	$ -	-	$ -	-	$ -	$ -	$ -
Lumber, Furniture, Pulp & Paper	38.5	7.14%	$214,779	2.7	$1,751,225	1.7	$416,505	$1,952,951	$710,918
Metal Products & Machinery	119.2	7.14%	$664,977	8.5	$5,421,974	6.9	$1,676,478	$6,433,474	$756,412
Misc. Manufacturing	-	7.14%	$ -	-	$ -	-	$ -	$ -	$ -
Retail	14.2	13.05%	$144,769	1.9	$1,181,349	1.8	$430,294	$1,466,874	$791,562
Miscellaneous	22.7	0.70%	$12,543	0.2	$100,600	0.2	$38,373	$126,430	$801,164
Primary Resource Industries	1.0	9.58%	$7,484	0.0	$12,210	0.1	$23,389	$28,115	$293,586
Schools K-12	-	1.42%	$ -	-	$ -	-	$ -	$ -	$ -
Stone, Clay, Glass & Concrete	2.3	7.14%	$ -	-	$ -	-	$ -	$ -	$ -
Textiles & Leather	59.5	7.14%	$331,931	4.2	$2,706,438	3.3	$805,127	$3,179,635	$748,944
Transportation Equipment	1.2	7.28%	$6,832	0.1	$55,710	0.1	$17,787	$66,665	$762,835
Warehouse	-	7.28%	$ -	-	$ -	-	$ -	$ -	$ -
Water & Wastewater	-	7.28%	$ -	-	$ -	-	$ -	$ -	$ -
Total				**21**		**16**			

Table 7-36: DEP Large C&I (≥1 MW) Segment Specific Program Potential

Large C&I – 1 MW and Up				Summer		Winter			
Segment	MW of Tech Potential for cost calc (max of winter and summer)	Participation	Total Cost	Agg. MW	Total Benefit	Agg. MW	Total Benefit	Total Aggregate Net Benefit	Total Net Benefit per Enrolled MW
Agriculture & Forestry	-	15.60%	$ -	-	$ -	-	$ -	$ -	$ -
Chemicals & Plastics	11.9	23.35%	$216,955	2.7	$1,726,522	2.8	$678,582	$2,188,149	$787,564
Colleges & Universities	-	19.03%	$ -	-	$ -	-	$ -	$ -	$ -
Data Centers	-	15.60%	$ -	-	$ -	-	$ -	$ -	$ -
Electrical & Electronic Equipment	15.2	23.35%	$277,119	3.5	$2,262,339	2.8	$689,987	$2,675,207	$753,824
Grocery stores / Convenience chains	-	8.85%	$ -	-	$ -	-	$ -	$ -	$ -
Healthcare	11.3	6.39%	$56,467	0.7	$460,315	0.6	$143,584	$547,432	$758,133
Hospitals	2.4	19.03%	$35,675	0.5	$291,204	0.2	$55,784	$311,314	$681,507
Institutional	11.5	19.03%	$170,941	2.2	$1,395,354	1.5	$357,947	$1,582,360	$722,921
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	19.03%	$ -	-	$ -	-	$ -	$ -	$ -
Lodging (Hospitality)	-	6.39%	$ -	-	$ -	-	$ -	$ -	$ -
Lumber, Furniture, Pulp & Paper	25.5	23.35%	$464,903	6.0	$3,795,372	5.3	$1,283,034	$4,613,502	$774,902
Metal Products & Machinery	121.0	23.35%	$2,206,012	28.3	$18,009,411	13.2	$3,227,543	$19,030,942	$673,645
Misc. Manufacturing	-	23.35%	$ -	-	$ -	-	$ -	$ -	$ -
Retail	8.5	8.85%	$58,813	0.5	$287,823	0.8	$183,787	$412,797	$548,571
Miscellaneous	22.7	5.03%	$89,424	1.1	$728,587	1.1	$270,533	$909,696	$795,948
Primary Resource Industries	1.0	15.60%	$12,183	0.0	$29,830	0.2	$38,096	$55,743	$357,374
Schools K-12	-	11.18%	$ -	-	$ -	-	$ -	$ -	$ -
Stone, Clay, Glass & Concrete	1.5	23.35%	$27,347	0.4	$223,257	0.3	$62,726	$258,636	$738,506
Textiles & Leather	61.4	23.35%	$1,119,415	14.3	$9,138,660	8.3	$2,024,342	$10,043,588	$700,610
Transportation Equipment	1.3	15.60%	$15,838	0.2	$129,265	0.2	$41,906	$155,332	$766,039
Warehouse	-	15.60%	$ -	-	$ -	-	$ -	$ -	$ -
Water & Wastewater	-	15.60%	$ -	-	$ -	-	$ -	$ -	$ -
Total				**60**		**37**			

7.7.4 Key Findings

The overall DR potential is estimated to be 97 MW of peak capacity in the base scenario, and is as high as 139 MW under the assumption of aggressive marketing strategies and substantial reductions in technology costs. These estimates are based on an in-depth, bottom-up assessment of load reduction potential of all customer segments, and includes an analysis of

program-based DR.

The extent to whether these potential figures can be attained in a cost-effective manner by 2041 depends on the ability to implement programs that target all possible end-uses and cost-effective customer segments. These predictions also rely upon certain assumptions around the future value of capacity, as well as technology cost reductions.

The customer segment-level analysis of the program-based DR potential sheds light on which customer segments can provide the greatest magnitude of capacity, as well as which customer segments are most cost-effective to pursue. Unsurprisingly, the most attractive customer segments from a benefit/cost perspective are customers who have more load available for reduction during peak hours: larger residential customers who live in single-family homes, as well as large C&I customers, particularly customers in manufacturing industries. In general, these customers are more capable of shifting load with little inconvenience/cost, and therefore tend to have higher participation levels in DR programs as well as greater willingness to shed a higher percentage of their load.

8 Appendices

Appendix A Glossary

Within the body of this report, there are several technical terms that require explanation. Additionally, some of the terms may appear to be similar at first review; however, have very different means. Terms such as “reported” and “verified” can easily be confused by the reader and are thus defined as following:

Baseline The expected energy usage level of a specific measure or project before improvements are implemented. This becomes the comparison value for all energy savings calculations.

Deemed Savings Amount of savings for a particular measure provided by documented and validated sources or reference materials. Often used when confidence is high for a specific measure, databases lack sufficient information, or costs of measurement and verification greatly outweigh the benefits.

Early Replacement Refers to an efficiency measure or efficiency program that seeks to encourage the replacement of functional equipment before the end of its operating life with higher-efficiency units.

Free-rider A participant who, on some level, would have acquired in the energy efficiency measure regardless of the program influence. Determining free-ridership values is a large component in calculating the Net-to-Gross ratio.

Gross Savings Total amount of a parameter of interest (kWh or kW) saved by a project/program.

Levelized Cost The cost of the energy efficiency investment on a per kilowatt hour basis levelized over the life of the program.

Net-to-Gross Ratio A ratio value determined through the process of surveying decision makers who implemented projects in order to account for free-ridership and other attribution effects. The net-to-gross (NTG) ratio is multiplied by gross verified savings to produce net savings. (NTG is typically calculated for a statistically significant sample of projects and then extrapolated to the population as a whole)

Net Savings Total amount of a parameter of interest (kWh, kW) saved by a program that is directly related to the program. It takes into account the realization rate, as well as results of the attribution analysis (free-riders), to provide a value of energy savings directly related to the program influence. Net Savings is calculated by multiplying the gross verified savings by the net-to-gross (NTG) ratio.

Participant Cost The cost to the participant to participate in an energy efficiency program.

Program A group of projects with similar technology characteristics that are installed in similar applications.

Replace-on-burnout: A DSM measure is not implemented until the existing technology it is replacing fails or burns out. An example would be a unitary air conditioning rooftop unit being purchased after the failure of the existing rooftop unit at the end of its useful life.

Reported Savings Savings calculated and reported by GPC. This also referred to as Ex-Ante savings.

Stratify The process of breaking down a population of projects into groups with similar characteristics (technical, financial, size, location, etc.). This is used during population sampling and allows projects with greater uncertainty or higher budgets to be accurately weighted to assess their impact on a program.

Sub-Strata The individual groups remaining once a population has been stratified.

Stipulated Savings Same as *Deemed Savings*

Verified Savings Savings determined by the evaluation team through the collection of data at on-site inspections, phone surveys, and engineering analysis. This also referred to as Ex-Post savings.

Appendix B MPS Measure List

For information on how Nexant developed this list, please see Section 4.

B.1 Residential Measures

Residential Measure Workbooks	
1.5 GPM Bathroom Faucet Aerators	2020_EISA_Energy Star Qualified CFL, Outdoor Use, 26 W
1.5 GPM Kitchen Faucet Aerators	2020_EISA_Energy Star Qualified CFL, Screw-In, 14 W
1.60 GPM Low-Flow Showerhead	2020_EISA_Energy Star Qualified CFL, Screw-In, 24 W
Air Sealing	2020_EISA_Energy Star Qualified CFL, Screw-In, 40 W
Air Source Heat Pump Maintenance	2020_EISA_Energy Star Qualified CFL, Screw-In, 9 W
ASHP from Electric Resistance	2020_EISA_Energy Star Qualified Dimmable CFL
ASHP, 2 Tons, 18 SEER, 9 HSPF	2020_EISA_Energy Star Qualified LED, Recessed Lighting
Basement or Crawlspace Wall Insulation R-15	2020_EISA_Energy Star Qualified LED, Screw-In, 10 W
Behavior Modification Home Energy Reports	2020_EISA_Energy Star Qualified LED, Screw-In, 14 W
Behavior Modification Home Energy Reports - Active Engagement	2020_EISA_Energy Star Qualified LED, Screw-In, 25 W
CEE Tier 2 Clothes Washer	2020_EISA_Energy Star Qualified LED, Screw-In, 6 W
Ceiling Insulation R-30	Energy Star Refrigerator
Ceiling Insulation R-49	Energy Star Room AC - 12 SEER
Central AC Maintenance	Energy Star Set-Top Receiver
Dehumidifier Recycling	Energy Star Television
Drain Water Heat Recovery	Energy Star Windows
Dual Speed Pool Pump Motors	Exterior Wall Insulation on Wall Above Grade R-13
Duct Insulation	Floor Insulation R-30
Duct Sealing	Freezer Recycling
Ductless Mini-Split HP, 2 Tons 15 SEER, 9 HSPF	Freezer Recycling
Electric Furnace ECM	Gas Furnace ECM
Energy Star Air Purifier	Green Roof
Energy Star ASHP, 2 Tons, 15 SEER, 8.5 HSPF	Heat Pump Clothes Dryer
Energy Star ASHP, 2 Tons, 16 SEER, 9.0 HSPF	Heat Pump Pool Heater
Energy Star Ceiling Fan	Heat Pump Water Heater 50 Gallons
Energy Star Central AC - 15 SEER	Heat Pump Water Heater 80 Gallons
Energy Star Central AC - 16 SEER	High Efficiency Bathroom Exhaust Fan
Energy Star Central AC - 18 SEER	Holiday Lights
Energy Star Central AC - 20 SEER	Home Energy Management System
Energy Star Clothes Dryer	Hot Water Pipe Insulation
Energy Star Clothes Washer	Indoor Daylight Sensor
Energy Star Dehumidifier	Insulating Tank Wrap on Water Heater

Residential Measure Workbooks	
Energy Star Desktop Computer	LED Nightlight
Energy Star Dishwasher (Electric Water Heating)	Occupancy Sensors, Switch Mounted
Energy Star Dishwasher (Gas Water Heating)	Outdoor Lighting Timer
Energy Star Doors	Outdoor Motion Sensor
Energy Star DVD Blu-Ray Player	Pre-Pay Program
Energy Star GSHP, 2 Tons, 17.1 SEER, 3.60 COP	Programmable Thermostat
Energy Star Manufactured Home	Properly Sized AC System
Energy Star Monitor	RealTime Information Monitoring
Energy Star Qualified 3-Way CFL	Refrigerator Recycling
Energy Star Qualified Airtight Can Lights	Refrigerator Recycling
Energy Star Qualified CFL, Light Fixture, 1 or 2 Sockets	Residential New Construction Tier 1 (10% more efficient)
Energy Star Qualified CFL, Light Fixture, 3 or More Sockets	Residential New Construction Tier 1 (20% more efficient)
Energy Star Qualified CFL, Outdoor Use, 26 W	Residential New Construction Tier 1 (30% more efficient)
Energy Star Qualified CFL, Screw-In, 14 W	Residential Whole House Fan
Energy Star Qualified CFL, Screw-In, 24 W	Room AC Recycling
Energy Star Qualified CFL, Screw-In, 40 W	Room AC Recycling
Energy Star Qualified CFL, Screw-In, 9 W	Smart Strip Plug (Entertainment Center)
Energy Star Qualified Dimmable CFL	Smart Strip Plug (Home Office)
Energy Star Qualified LED, Recessed Lighting	Smart Thermostat
Energy Star Qualified LED, Screw-In, 10 W	Solar Attic Fan
Energy Star Qualified LED, Screw-In, 14 W	Solar Electric Water Heater
Energy Star Qualified LED, Screw-In, 25 W	Thermostatic Shower Restriction Valve
Energy Star Qualified LED, Screw-In, 6 W	Variable Speed Pool Pump Motors
2020_EISA_Energy Star Qualified 3-Way CFL	Water Heater Thermostat Setback
2020_EISA_Energy Star Qualified Airtight Can Lights	Window Shade Film
2020_EISA_Energy Star Qualified CFL, Light Fixture, 3 or More Sockets	

B.2 Commercial Measures

Commercial Measure Workbooks	
1.5 GPM Faucet Aerators	Facility Commissioning
1.5HP Open Drip-Proof(ODP) Motor	Facility Energy Management System
1.75 GPM Low-Flow Showerhead	Fan Thermostat Controller
10HP Open Drip-Proof(ODP) Motor	Floating Head Pressure Controller
20HP Open Drip-Proof(ODP) Motor	Green LED Traffic Light
2x4 LED Troffer	Green Roof
4' 4-Lamp High Bay T5 Fixture (28W)	Hand-Man Crosswalk Sign
4' 4-Lamp High Bay T5 Fixture (28W) replacing HID	HE Air Cooled Chiller - All Compressor Types - 100 Tons

Commercial Measure Workbooks	
42W 6 Lamp High Bay Compact Fluorescent	HE DX 11.25-20.0 Tons Elect Heat
42W 6 Lamp High Bay Compact Fluorescent HID Baseline	HE DX 11.25-20.0 Tons Other Heat
Air Compressor Optimization	HE DX 20.0-63.33 Tons Elect Heat
Anti-Sweat Heater Controls (Cooler)	HE DX 20.0-63.33 Tons Other Heat
Auto Closer on Refrigerator Door	HE DX 5.4-11.25 Tons Elect Heat
Auto Off Time Switch	HE DX 5.4-11.25 Tons Other Heat
Automated Controls System	HE DX Less than 5.4 Tons Elect Heat
Beverage Vending Machine Controls	HE DX Less than 5.4 Tons Other Heat
Bi-Level Lighting Control	HE DX more than 63.33 Tons Elect Heat
Business Energy Report	HE DX more than 63.33 Tons Other Heat
Ceiling Insulation R40	HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons
Central Lighting Control System	HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons
Ceramic Metal Halide Lamp	HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons
Ceramic Metal Halide Lamp HID Baseline	HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons
Ceramic Metal Halide, 20 - 100W	Heat Pump Water Heater 50 Gallons
Ceramic Metal Halide, 20 - 100W HID Baseline	High Efficiency Air Compressor
Ceramic Metal Halide, 350W+	High Efficiency CRAC Unit
Ceramic Metal Halide, 350W+ HID Baseline	High Efficiency Refrigeration Compressor - Discus
Chilled Water Reset	High Efficiency Refrigeration Compressor - Scroll
CO Sensors for Parking Garage Exhaust	High Performance Medium Bay T8 Fixture
Data Center Server Consolidation	High Speed Fans
Demand Controlled Circulating Systems	Hot Water Pipe Insulation
Demand Controlled Ventilation	Hotel Key Card Room Energy Control System
Demand Defrost	Indoor Daylight Sensor
Door Gasket (Cooler)	Induction High Bay Lighting
Door Gasket (Freezer)	Insulating Tank Wrap on Water Heater
Drain Water Heat Recovery	LED Canopy Lighting
Dual Entropy Economizer	LED Exit Sign
Ductless Mini-Split AC, 4 Ton, 16 SEER	LED Exterior Area Lights
Ductless Mini-Split HP, 4 Ton, 16 SEER, 9 HSPF	LED Exterior Wall Packs
DX Coil Cleaning	LED or Equivalent Sign Lighting
Efficient New Construction Lighting	LEED New Construction Whole Building
Electric Resistance Water Heater	Light Tube
Energy Recovery Ventilation System	Lighting Energy Management System
Energy Star Combination Oven	Linear LED replacing T8
Energy Star Commercial Clothes Washer (Electric Water Heating)	Low-Flow Pre-Rinse Sprayers
Energy Star Convection Oven	Network PC Power Management

Commercial Measure Workbooks	
Energy Star Copiers	Occupancy Sensors, Ceiling Mounted
Energy Star Dishwasher	Occupancy Sensors, Switch Mounted
Energy Star Fax	Outdoor Motion Sensor
Energy Star Fryer	Packaged Terminal AC
Energy Star Glass-Door Freezer	Packaged Terminal HP
Energy Star Glass-Door Refrigerator	Photocell Dimming Control (Exterior)
Energy Star Griddle	Photocell Dimming Control (Interior)
Energy Star Hot Food Holding Cabinet	Programmable Thermostat
Energy Star Ice Machines (Self Contained Units)	PSC to ECM Evaporator Fan Motor (Reach-In)
Energy Star Monitors	PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)
Energy Star PCs-Desktop	Pulse Start Metal Halide, 320 - 400W
Energy Star Printers	Pulse Start Metal Halide, 320 - 400W HID Baseline
Energy Star Qualified 3-Way CFL	RealTime Information Monitoring
Energy Star Qualified CFL, Light Fixture, 1 or 2 Sockets	Red LED Traffic Light
Energy Star Qualified CFL, Outdoor Use, 26 W	Reduced Wattage (25W) T8 Fixture
Energy Star Qualified CFL, Screw-In, 15 W	Reduced Wattage (28W) T8 Fixture
Energy Star Qualified LED Lamp, All Shapes and Directions	Reduced Wattage (28W) T8 Relamping
Energy Star Qualified LED Shelf-Mounted Task Lighting	Reflective Roof Treatment
Energy Star Qualified LED, Recessed Lighting	Refrigerated Display Case LED Lighting
2020 EISA Energy Star Qualified 3-Way CFL	Refrigerated Display Case Lighting Controls
2020 EISA Energy Star Qualified CFL, Light Fixture, 1 or 2 Sockets	Refrigeration Commissioning
2020 EISA Energy Star Qualified CFL, Outdoor Use, 26 W	Retro-Commissioning (Existing Construction)
2020 EISA Energy Star Qualified CFL, Screw-In, 15 W	Smart Strip Plug Outlet
2020 EISA Energy Star Qualified LED Lamp, All Shapes and Directions	Smart Thermostat
2020 EISA Energy Star Qualified LED Lamp, All Shapes and Directions-CFL Baseline	Solar Electric Water Heater
2020 EISA Energy Star Qualified LED, Recessed Lighting	Solid State Cooking Hood Controls
2020 EISA Energy Star Qualified LED, Recessed Lighting-CFL Baseline	SP to ECM Evaporator Fan Motor (Walk-In, Refrigerator)
Energy Star Room AC - 12 SEER	Time Clock Control
Energy Star Scanners	VAV System
Energy Star Servers	Vertical Night Covers
Energy Star Solid-Door Freezer	VFD on Chilled Water Pumps
Energy Star Solid-Door Refrigerator	VFD on HVAC Fan
Energy Star Steamer	VFD on HVAC Pump
Energy Star Uninterruptable Power Supply	VSD Controlled Compressor
Energy Star Vending Machine	Water Source Heat Pump
Energy Star Water Coolers	Window Shade Film

Commercial Measure Workbooks	
Energy Star Windows	Yellow LED Traffic Light
Exterior Bi-Level Lighting Control	

B.3 Industrial Measures

Industrial Measure Workbooks	
1.5HP Open Drip-Proof(ODP) Motor	HE DX 5.4-11.25 Tons Elect Heat
10HP Open Drip-Proof(ODP) Motor	HE DX 5.4-11.25 Tons Other Heat
20HP Open Drip-Proof(ODP) Motor	HE DX Less than 5.4 Tons Elect Heat
2x4 LED Troffer	HE DX Less than 5.4 Tons Other Heat
3-phase High Frequency Battery Charger - 1 shift	HE DX more than 63.33 Tons Other Heat
4' 4-Lamp High Bay T5 Fixture (28W)	HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons
4' 4-Lamp High Bay T5 Fixture (28W)-HID Baseline	HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons
42W 6 Lamp High Bay Compact Fluorescent	HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons
42W 6 Lamp High Bay Compact Fluorescent-HID Baseline	HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons
Air Compressor Optimization	High Bay Occupancy Sensors, Ceiling Mounted
Auto Closer on Refrigerator Door	High Efficiency Refrigeration Compressor - Discus
Auto Off Time Switch	High Efficiency Refrigeration Compressor - Scroll
Automated Controls System	High Efficiency Welder
Bi-Level Lighting Control	High Performance Medium Bay T8 Fixture
Ceiling Insulation R40	High Speed Fans
Central Lighting Control System	High Volume Low Speed Fan (HVLS)
Ceramic Metal Halide Lamp	Indoor Daylight Sensor
Ceramic Metal Halide Lamp-HID Baseline	Induction High Bay Lighting
Ceramic Metal Halide, 20 - 100W	Injection Mold and Extruder Barrel Wraps
Chilled Water Reset	Insulated Pellet Dryer Tanks and Ducts
Cogged Belt on 15HP ODP Motor	LED Canopy Lighting
Cogged Belt on 40HP ODP Motor	LED Exit Sign
Compressed Air Storage Tank	LED Exterior Area Lights
Demand Controlled Ventilation	LED Exterior Wall Packs
Demand Defrost	LED or Equivalent Sign Lighting
Dew Point Sensor Control for Desicant CA Dryer	LEED New Construction Whole Building
Drip Irrigation Nozzles	Linear LED replacing T8
Dual Entropy Economizer	Low Energy Livestock Waterer
DX Coil Cleaning	Low Pressure Sprinkler Nozzles
Efficient Compressed Air Nozzles	Low Pressure-drop Filters
Efficient New Construction Lighting	Occupancy Sensors, Ceiling Mounted
Electric Actuators	Outdoor Motion Sensor
Energy Efficient Laboratory Fume Hood	Packaged Terminal AC

Industrial Measure Workbooks	
Energy Efficient Transformers	Photocell Dimming Control (Exterior)
Energy Recovery Ventilation System	Photocell Dimming Control (Interior)
ENERGY STAR Qualified 3-Way CFL	Process Cooling Ventilation Reduction
Energy Star Qualified CFL, Light Fixture, 1 or 2 Sockets	Programmable Thermostat
ENERGY STAR Qualified CFL, Outdoor Use, 26 W	Pulse Start Metal Halide, 320 - 400W
ENERGY STAR Qualified CFL, Screw-In, 15 W	Pulse Start Metal Halide, 320 - 400W-HID Baseline
ENERGY STAR Qualified LED Lamp, All Shapes and Directions	Pulse Start Metal Halide, 400 - 750W
Energy Star Qualified LED Shelf-Mounted Task Lighting	Pulse Start Metal Halide, 400 - 750W-HID Baseline
ENERGY STAR Qualified LED, Recessed Lighting	Reduced Wattage (25W) T8 Fixture
2020 EISA ENERGY STAR Qualified 3-Way CFL	Reduced Wattage (28W) T8 Fixture
2020 EISA Energy Star Qualified CFL, Light Fixture, 1 or 2 Sockets	Reduced Wattage (28W) T8 Relamping
2020 EISA ENERGY STAR Qualified CFL, Outdoor Use, 26 W	Reflective Roof Treatment
2020 EISA ENERGY STAR Qualified CFL, Screw-In, 15 W	Refrigeration Commissioning
2020 EISA ENERGY STAR Qualified LED Lamp, All Shapes and Directions	Retro-Commissioning
2020 EISA ENERGY STAR Qualified LED, Recessed Lighting	Small Buildings Retro-Commissioning
Energy Star Room AC - 12 SEER	Smart Thermostat
Energy Star Windows	Synchronous Belt on 15HP ODP Motor
Exterior Bi-Level Lighting Control	Synchronous Belt on 5HP ODP Motor
Facility Commissioning	Synchronous Belt on 75HP ODP Motor
Facility Energy Management System	Time Clock Control
Fan Thermostat Controller	VAV System
Floating Head Pressure Controller	VFD on Air Compressor
Grain Bin Aeration Control System	VFD on Chilled Water Pumps
HE Air Cooled Chiller - All Compressor Types - 100 Tons	VFD on HVAC Fan
HE Air Cooled Chiller - All Compressor Types - 300 Tons	VFD on HVAC Pump
HE DX 11.25-20.0 Tons Elect Heat	VFD on Process Pump
HE DX 11.25-20.0 Tons Other Heat	VSD Controlled Compressor
HE DX 20.0-63.33 Tons Elect Heat	Water Source Heat Pump
HE DX 20.0-63.33 Tons Other Heat	Window Shade Film

Appendix C Customer Demand Characteristics

Customer demand on peak days was analyzed by rate classes within each sector. Outputs presentation includes load shapes on peak days and average days, along with the estimates of technical potential by end uses. The two end uses, Air Conditioning and Heating, were studied for both residential and large C&I customers; however, in residential sector, another two end uses were also incorporated into the analyses, which are Water Heaters and Pool Pumps.

Residential

Air Conditioning

The cooling load shapes on the summer peak weekday and average weekdays were generated from hourly load research sample in South Carolina Service territories for the years 2013 and 2014. A regression model was built to estimate relationship between load values and cooling degree days (CDD) (shown as *Equation (1)*). The p-values of the model and coefficient are both less than 0.05, which means that they are of statistically significance. The product of actual hourly CDD values and coefficient would be used as cooling load during that hour in terms of per customer.

Equation (1):

$$Load_t = CDD_t * \beta_1 + i.month + \varepsilon$$

Where:

t	Hours in each day in year 2013 and 2014
$Load_t$	Load occurred in each hour
CDD_t	Cooling Degree Day value associated with each hour
β_1	Change in average load per CDD
$i.month$	Nominal variable, month
ε	The error term

To study the peak technical potential, a peak day was selected if it has the hour with system peak load during summer period (among April to October). Technical potential for residential customers was then calculated as the aggregate consumption during that summer peak hour.

The Figure 8-1 and Figure 8-2 displays the comparison of cooling load shape on summer peak weekday and average weekdays in SC DEC and DEP territories. By comparing these two load shapes in the Figure 8-1, peak hours in DEC territory could be identified as around 4:00 pm to 8:00 pm in summer time. As cooling load is highly sensitive to weather, the maximum usage per customer during summer peaks is almost 2 times greater than average usage in the same time on normal days for all the rate classes. The least consumption occurs between 6:00 am to 8:00 am in the morning, when houses are cooled down over night and before heated by direct

sunshine. The customers in “TOU” rate class have the highest average cooling consumption, followed by the customers in “RS” rate class as second, and the customers in “RE” as the third. Same trends are examined in the Figure 8-2, and the customers in “TOU” rate class consumes more energy on cooling than those customers in “RES” rate class.

Figure 8-1: Average Cooling Load Shapes for DEC Customers

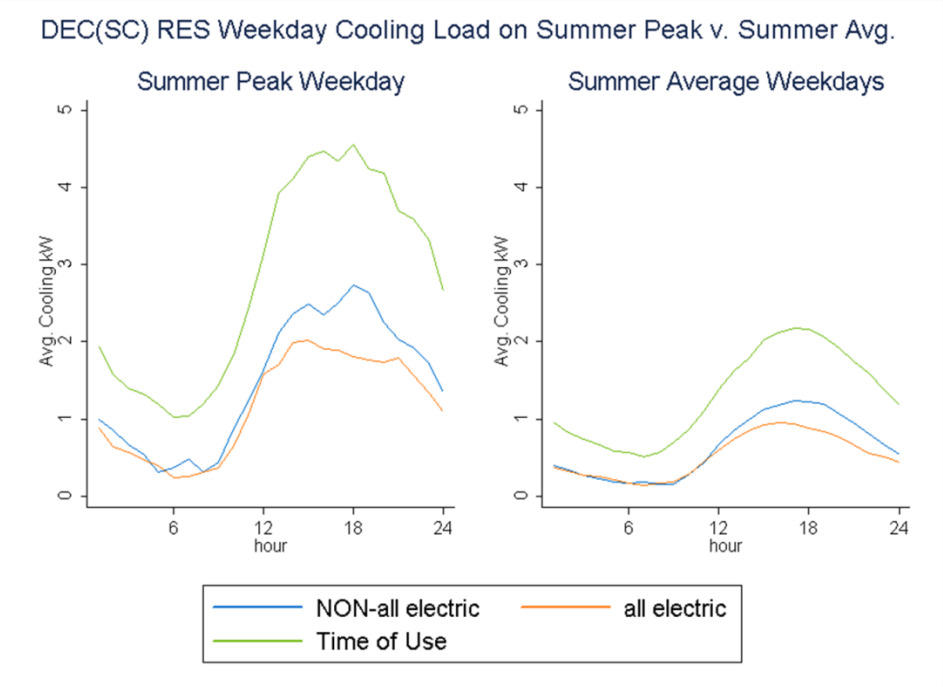
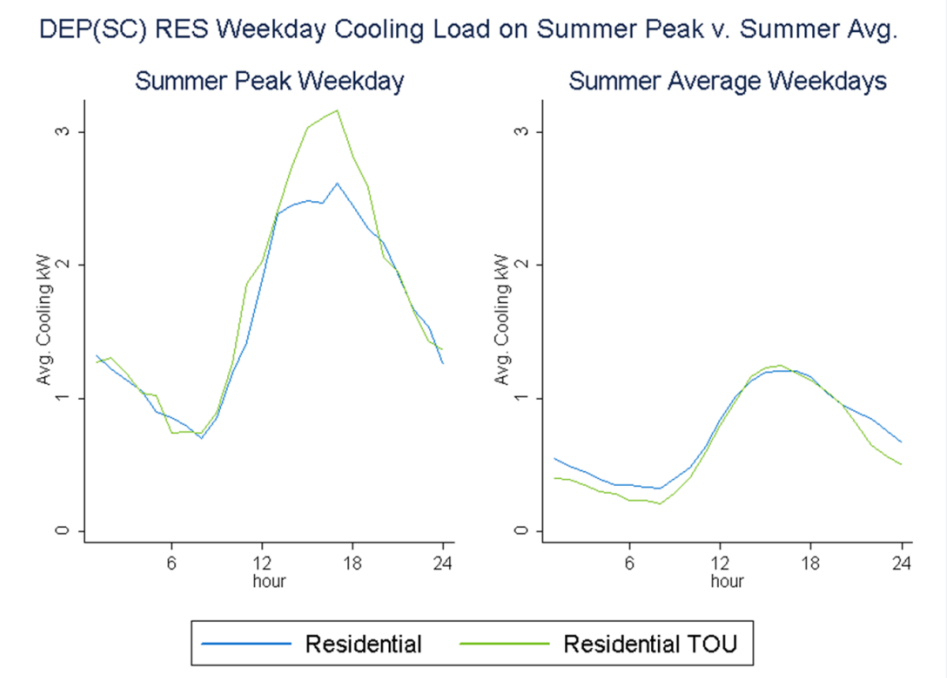


Figure 8-2: Average Cooling Load Shapes for DEP Customers



Estimates of technical potential are listed in Table 8-1and Table 8-2, which was derived by

multiplying average usage by customer (showed in load shapes), number of residential customers and saturation of air conditioning in NC DEC and DEP territories.

Table 8-1: DEC Technical DR Potential for Residential Cooling

DEC - Residential							
Hour Ending	MW			Hour Ending	MW		
	RS	RE	RT		RS	RE	RT
1	221	149	0.49	**13**	471	291	0.99
2	189	107	0.40	**14**	524	339	1.04
3	147	96	0.35	**15**	552	344	1.11
4	121	80	0.33	**16**	522	323	1.13
5	70	68	0.30	**17**	558	320	1.10
6	80	41	0.26	**18**	609	308	1.15
7	106	42	0.26	**19**	585	301	1.07
8	69	54	0.30	**20**	500	295	1.06
9	99	63	0.36	**21**	454	303	0.94
10	196	111	0.46	**22**	427	267	0.91
11	271	180	0.61	**23**	383	227	0.84
12	362	268	0.79	**24**	300	186	0.67

Table 8-2: DEP Technical DR Potential for Residential Cooling

DEP - Residential					
Hour Ending	MW		Hour Ending	MW	
	RES	TOU		RES	TOU
1	162	2.25	**13**	292	4.26
2	150	2.30	**14**	300	4.84
3	140	2.09	**15**	305	5.36
4	130	1.84	**16**	302	5.48
5	110	1.80	**17**	321	5.58
6	105	1.30	**18**	300	4.98
7	97	1.31	**19**	280	4.56
8	85	1.30	**20**	266	3.63
9	105	1.58	**21**	237	3.44
10	146	2.23	**22**	205	2.93
11	174	3.29	**23**	189	2.53
12	232	3.57	**24**	155	2.41

Space Heating

Similar to the analyses for air conditioning, the heating load shapes on peak day and average days were obtained from the same hourly load research profile in 2013 and 2014, and the peak day was defined as the day with system peak load during winter period. The regression model was modified to evaluate relationship between energy consumption and heating degree days (HDD) (shown as Equation (2)), but the technical potential was calculated in the same way as illustrated earlier.

Equation (2):

$$Load_t = HDD_t * \beta_1 + i.month + \varepsilon$$

Where:

t	Hours in each day in year 2013 and 2014
$Load_t$	Load occurred in each hour
HDD_t	Heating Degree Day value associated with each hour
β_1	Change in average load per HDD
$i.month$	Nominal variable, month
ε	The error term

The Figure 8-3 and Figure 8-4 capture hourly peak usage and average usage for SC DEC and DEP territories. The load shape on winter average weekdays shows that space heating consumes more energy after midnight to early morning. However, the historical data reveals a somewhat abnormality of peak usage. Examined from the figure, the average energy consumption on peak weekday is substantially higher than average weekdays. Customers in "RS" rate class are assumed not to consume energy on heating end use, as almost all of them are using gas as their heating source.

Figure 8-3: Average Heating Load Shapes for DEC Customers

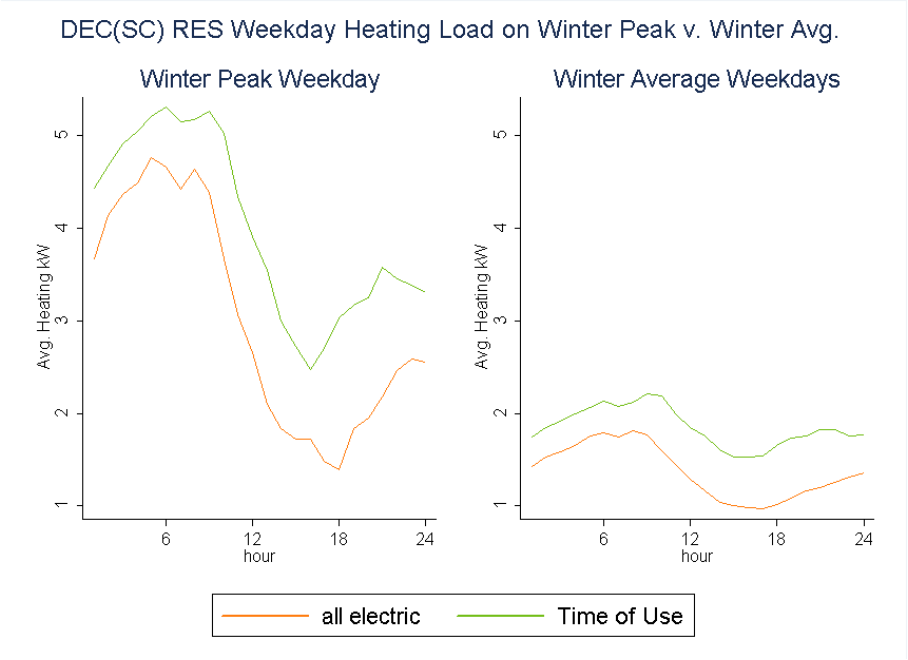


Figure 8-4: Average Heating Load Shapes for DEP Customers

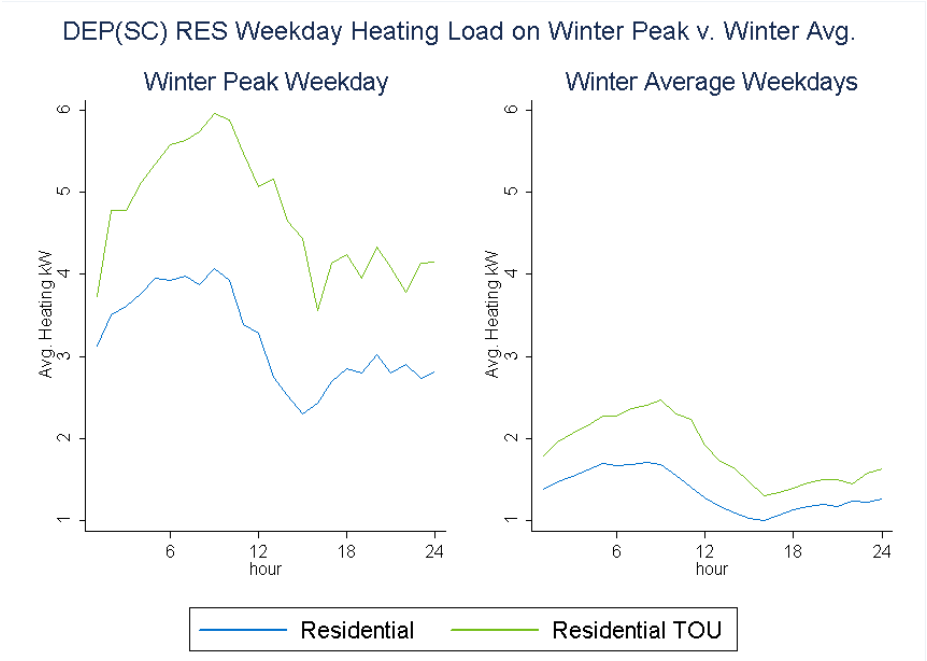


Table 8-3 and Table 8-4 show the technical potentials by rate class on peak day for those two territories.

Table 8-3: DEC Technical DR Potential for Residential Heating

DEC - Residential					
Hour Ending	MW		Hour Ending	MW	
	RE	RT		RE	RT
1	635	0.03	13	362	0.02
2	714	0.03	14	317	0.02
3	754	0.03	15	298	0.02
4	776	0.04	16	298	0.02
5	824	004	17	257	0.02
6	806	0.04	18	240	0.02
7	764	0.04	19	318	0.02
8	802	0.04	20	338	0.02
9	759	0.04	21	376	0.03
10	634	0.04	22	426	0.02
11	530	0.03	23	448	0.02
12	459	0.03	24	441	0.02

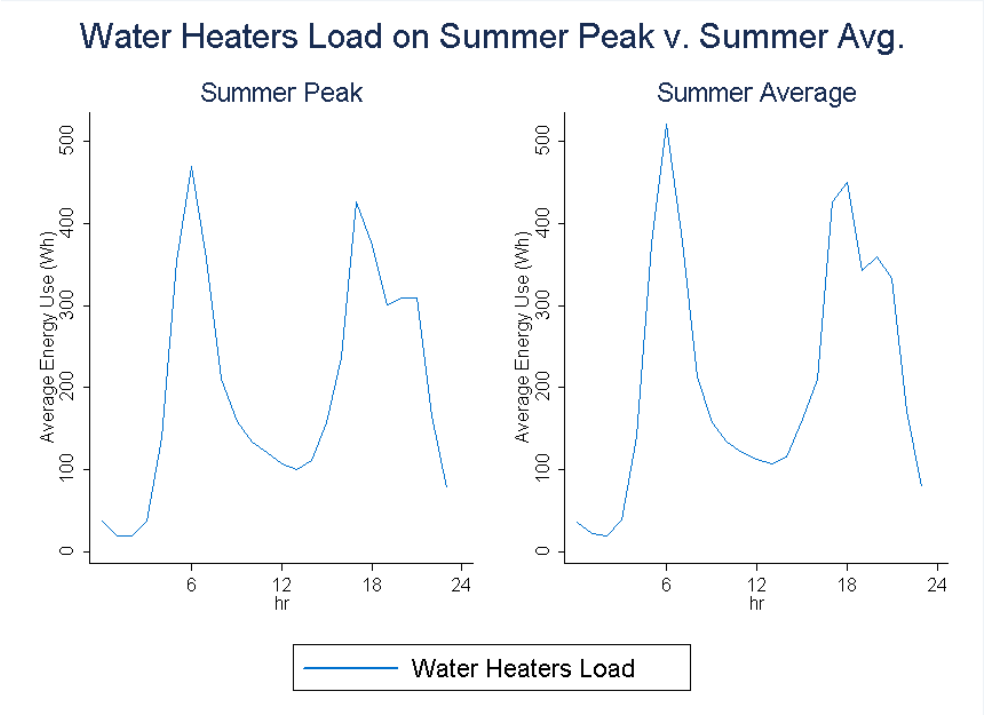
Table 8-4: DEP Technical DR Potential for Residential Heating

DEP - Residential					
Hour Ending	MW		Hour Ending	MW	
	RES	TOU		RES	TOU
1	259	5.12	13	228	7.08
2	290	6.56	14	210	6.38
3	300	6.56	15	191	6.09
4	313	7.01	16	201	4.88
5	328	7.33	17	224	5.67
6	326	7.65	18	237	5.82
7	330	7.72	19	232	5.42
8	322	7.86	20	250	5.95
9	338	8.17	21	232	5.60
10	326	8.06	22	241	5.18
11	281	7.50	23	226	5.68
12	273	6.95	24	234	5.68

Water Heaters

Interval load data by end-use are not available for individual customers in Duke territory, so the analyses of water heaters was completed based on end-use metered data from CPS (San Antonio) Home Manager Program. As water heater loads were assumed to be relatively constant throughout the year (used for summer and winter), average load profiles for water heaters on CPS's 2013 system peak were assumed to be representative for residential customers in Duke jurisdictions.

Figure 8-5: Average Water Heaters Load Shapes for DEC Customers

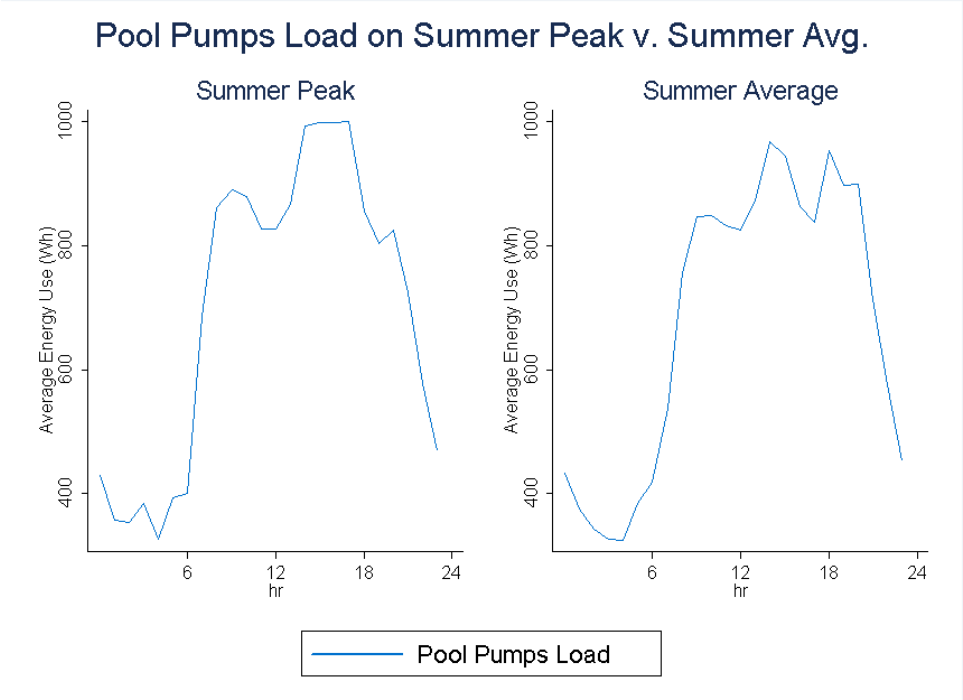


It is apparent from the Figure 8-6 that there is not much difference from peak usage and average usage, which proves that water heater loads has low sensitivity to weather. There are two spikes in a day, indicating two shifts when people would be likely to take showers. The time periods with highest consumption are 5:00 am – 7:00 am and 5:00 pm – 8:00 pm.

Pool Pumps

Likewise, pool pump loads were assumed to be fairly constant throughout the summer time as well, so the average load profiles for pool pumps from CPS's project were also used to represent for residential customers in Duke jurisdictions.

Figure 8-6: Average Pool Pumps Load Shapes for DEC Customers



According to the Figure 8-4, the peak hours for pool pumps are 3:00 pm to 6:00 pm, and there is minor sensitivity with weather observed by comparing peak loads and average loads.

Large C&I Customers

Estimates of technical potential were based on one year of interval data (2014) for all non-residential customers in three categories based on maximum loads: 300-500 kW, 500kW-1MW, and over 1 MW. Customers were categorized into one of 23 industry segments for the purpose of analysis. Technical potential for these customers was defined as the aggregate usage within each segment during summer and winter peak system hours.

Visual presentations of the results are shown below. These graphs are useful to identify the segments with the highest potential as well as examine the weather-sensitivity of each segment by comparing peak usage to the average usage in each season. For example, the segments with the highest technical potential are chemicals & plastics, lumber, furniture, pulp & paper, and textiles & leather segment in DEC territory, and metal products & machinery and textiles & leather in DEP territory. No segments show any weather sensitivity in either season.

Figure 8-7: Aggregate Load Shapes for DEC Large C&I Customers

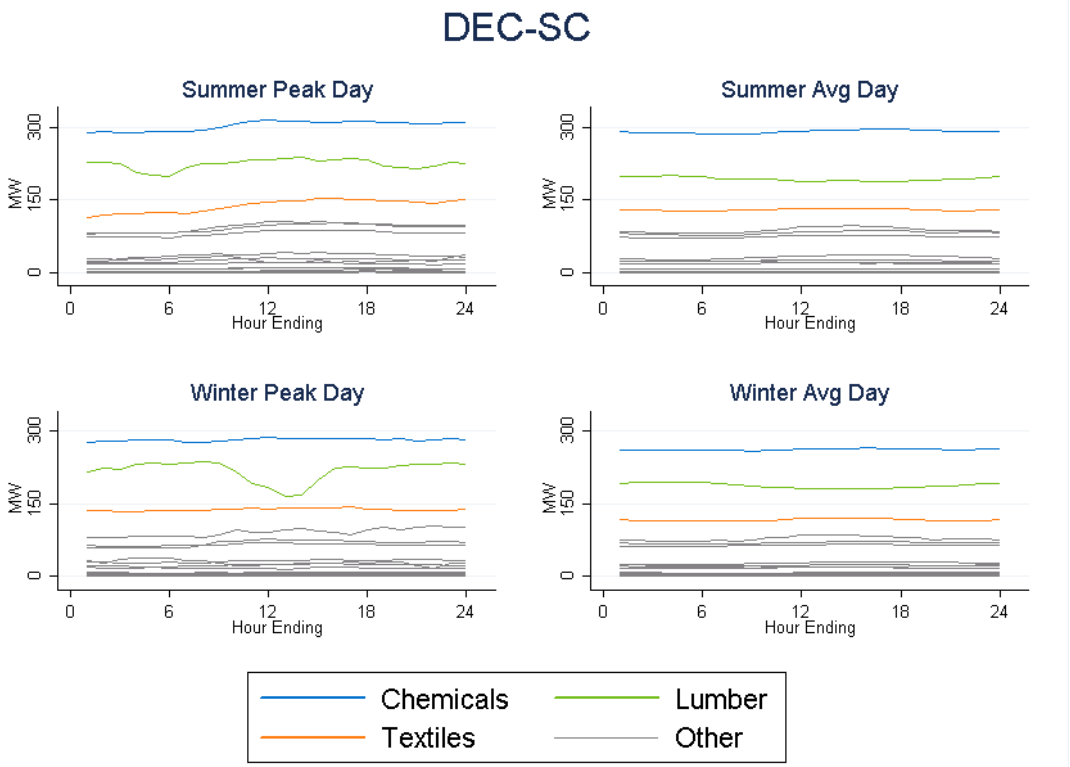
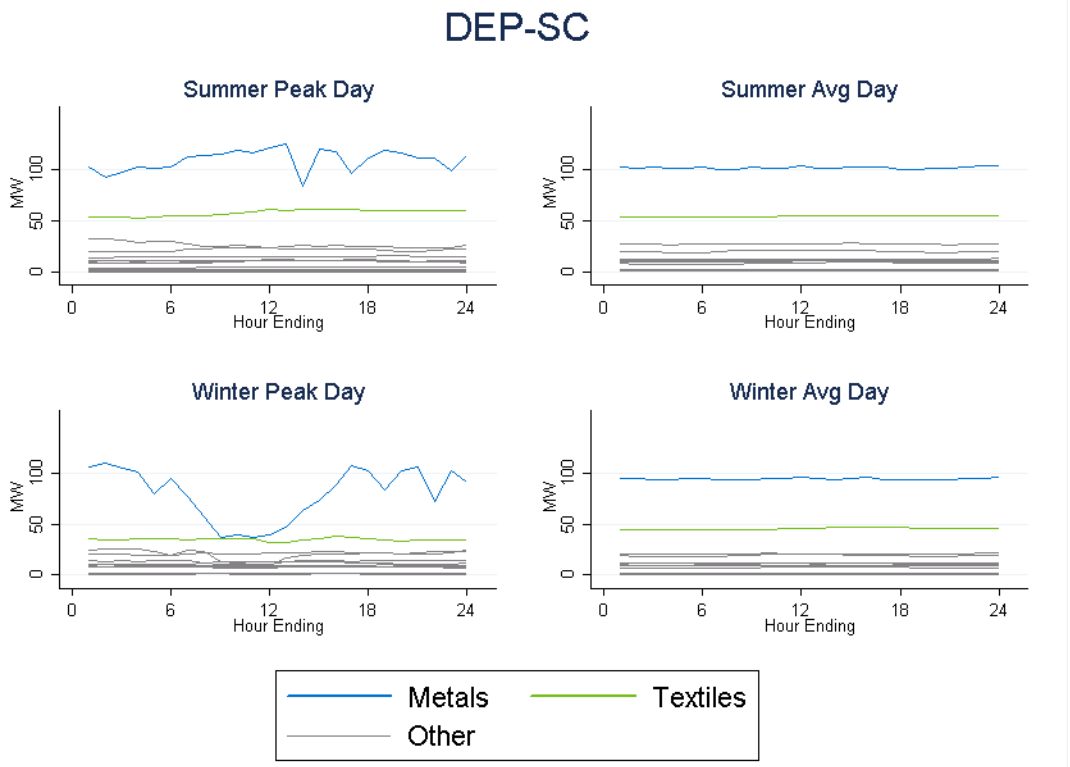


Figure 8-8: Aggregate Load Shapes for DEP Large C&I Customers



More precise estimates of technical potential are shown in Table 8-5 and Table 8-6, which focuses on peak period potential in each season. The specific hours included in the peak period were informed by the analysis of system loads presented earlier in this memo.

Table 8-5: DEC Technical DR Potential for Large C&I Customers

Segment	Summer Peak	Winter Peak
Agriculture & Forestry	-	-
Chemicals & Plastics	615.2	555.5
Colleges & Universities	78.1	56.3
Data Centers	-	-
Electrical & Electronic Equipment	175.4	120.0
Grocery stores / Convenience chains	-	-
Healthcare	44.4	29.2
Hospitals	6.6	4.1
Institutional	3.8	2.1
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	-
Lodging (Hospitality)	0.8	0.7
Lumber, Furniture, Pulp & Paper	231.0	234.4
Metal Products & Machinery	104.5	82.6
Misc. Manufacturing	2.1	2.6
Misc. Retail	18.6	13.0
Miscellaneous	29.0	21.0
Primary Resource Industries	50.3	66.4
Schools K-12	1.3	0.5
Stone, Clay, Glass & Concrete	40.6	31.5
Textiles & Leather	152.5	134.7
Transportation Equipment	199.3	126.7
Warehouse	6.3	5.0
Water & Wastewater	17.8	14.6

Table 8-6: DEP Technical DR Potential for Large C&I Customers

Segment	Summer Peak	Winter Peak
Agriculture & Forestry	-	-
Chemicals & Plastics	24.1	23.8
Colleges & Universities	-	-
Data Centers	-	-
Electrical & Electronic Equipment	30.7	25.8
Grocery stores / Convenience chains	-	-
Healthcare	23.3	18.6
Hospitals	4.6	2.4
Institutional	22.1	15.6
Large Public Assembly (Churches, Stadiums, Arena, & Sports Venues)	-	-
Lodging (Hospitality)	-	-
Lumber, Furniture, Pulp & Paper	64.0	46.4
Metal Products & Machinery	240.2	152.9
Misc. Manufacturing	-	-
Misc. Retail	19.3	22.0
Miscellaneous	45.4	44.6
Primary Resource Industries	0.5	2.1
Schools K-12	-	-
Stone, Clay, Glass & Concrete	3.8	2.7
Textiles & Leather	121.0	81.7
Transportation Equipment	2.5	2.1
Warehouse	-	-
Water & Wastewater	-	-

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Attachment B

UCT Calculations based on SC Avoided Cost Rates and Program Costs
Source: Docket No. 2017-245-E Exhibit 7 pages 1, 3, 5
Note: Minor variances in Total Portfolio NPV of AC and Program Costs due to rounding

	2014		
	NPV of AC	Program Cost	UCT
Appliance Recycling Program	1,637,801	1,158,669	1.41
Energy Education Program for Schools	-	-	-
Energy Efficient Lighting	44,964,508	19,568,074	2.30
Home Energy Improvement Program	5,750,886	4,815,463	1.19
Multi-Family	-	-	-
Neighborhood Energy Saver	854,095	1,731,995	0.49
Residential Energy Assessments	-	-	-
Residential New Construction	9,958,239	6,463,222	1.54
Save Energy and Water Kit	-	-	-
Residential Energy Efficient Benchmarking	1,051,078	171,840	6.12
My Home Energy Report		69,946	0.00
EnergyWise	46,090,768	7,853,109	5.87
Business Energy Report	-	-	-
Energy Efficiency for Business	35,264,862	7,246,868	4.87
Non-Residential Lighting Program	9,793,661	2,376,609	4.12
Small Business Energy Saver	23,982,238	10,108,917	2.37
EnergyWise for Business	-	-	-
CIG Demand Response	6,188,262	3,586,779	1.73
Total Portfolio	**185,536,398**	**65,151,491**	**2.85**

	2015		
	NPV of AC	Program Cost	UCT
Appliance Recycling Program	1,508,567	1,219,750	1.24
Energy Education Program for Schools	1,026,722	703,591	1.46
Energy Efficient Lighting	35,910,710	14,612,619	2.46
Home Energy Improvement Program	6,858,804	5,294,395	1.30
Multi-Family	9,063,458	2,615,745	3.46
Neighborhood Energy Saver	1,134,613	1,579,671	0.72
Residential Energy Assessments	-	-	-
Residential New Construction	10,171,573	7,441,832	1.37
Save Energy and Water Kit	-	-	-
Residential Energy Efficient Benchmarking	-	-	-
My Home Energy Report	7,732,605	5,808,845	1.33
EnergyWise	32,617,641	5,204,195	6.27
Business Energy Report		73,518	0.00
Energy Efficiency for Business	29,902,372	6,220,063	4.81
Non-Residential Lighting Program	11,551,470	1,775,531	6.51
Small Business Energy Saver	25,239,036	9,779,593	2.58
EnergyWise for Business		64,145	0.00
CIG Demand Response	1,025,439	569,290	1.80
Total Portfolio	**173,743,010**	**62,962,783**	**2.76**

	2016		
	NPV of AC	Program Cost	UCT
Appliance Recycling Program	75,967	(136,970)	-0.55
Energy Education Program for Schools	1,069,008	825,794	1.29
Energy Efficient Lighting	33,900,924	15,516,690	2.18
Home Energy Improvement Program	6,972,997	5,998,375	1.16
Multi-Family	6,817,700	2,039,856	3.34
Neighborhood Energy Saver	1,170,879	2,041,134	0.57
Residential Energy Assessments	3,790,119	1,414,281	2.68
Residential New Construction	21,268,023	9,381,404	2.27
Save Energy and Water Kit	9,916,115	673,150	14.73
Residential Energy Efficient Benchmarking	-	-	-
My Home Energy Report	10,613,915	5,877,786	1.81
EnergyWise	70,854,171	6,800,534	10.42
Business Energy Report	308,351	69,211	4.46
Energy Efficiency for Business	47,738,458	14,122,010	3.38
Non-Residential Lighting Program	10,838,755	1,885,382	5.75
Small Business Energy Saver	33,095,951	9,316,875	3.55
EnergyWise for Business	807,334	1,107,571	0.73
CIG Demand Response	(10,684,733)		-
Total Portfolio	**248,553,934**	**76,933,083**	**3.23**